



CITY OF LONG BEACH

**Department of Public Works
City of Long Beach Fire Station 9
4101 Long Beach Boulevard**

**Contract Documents
Plans and Specifications**

**Project Number 3005010108
Specification R-7206
Plans/Drawings B-4797**

**Project Management Bureau
Long Beach, California**

On-Site Mandatory Prebid Conference
On November 1, 2023 at 10:00 AM

Mandatory Prebid Job-Site Walk-Through
On November 1, 2023 at 11:00 AM

FIRE STATION 9
CONSTRUCTION OF A REPLACEMENT FIRE STATION 9 AT 4101 LONG BEACH
BOULEVARD

CONTRACT DOCUMENTS
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PROJECT PLANS DRAWING No. B-4797

DIVISION A
NOTICE INVITING BIDS

DIVISION A
NOTICE INVITING BIDS
FOR
FIRE STATION 9

RECEIPT OF BIDS: Bids will be accepted on behalf of the City, Owner of the Work, until 3:00 p.m. December 6, 2023, for the New Fire Station 9 via the City's online portal <https://longbeachbuys.buyspeed.com/bsol> keyword R-7206

MANDATORY PRE-BID ON-SITE CONFERENCE AND JOB-SITE WALK-THROUGH: The City will conduct a mandatory on-site pre-bid conference at 4101 Long Beach Blvd., Long Beach, CA 90807, to review bidding processes, Project Labor Agreement (PLA), and SBE program requirements at 10:00 a.m., followed by a job site walk at 11:00 a.m. on November 1, 2023.

The pre-bid conference will be conducted externally at the site. Prospective Bidders must attend this meeting and subsequent job-site walk.

DESCRIPTION OF WORK: The Work to be done consists primarily of the furnishing of all administration, labor, materials, tools, equipment and incidentals required to complete the Fire Station 9 Project, all in accordance with the Contract Documents, enumerated in the Contract. The scope includes the demolition of the existing building, perimeter walls and planters, pavement and fencing. The construction of a new 12,779 SF two-story fire station that will house eight (8) on duty firefighters. On the first level the new fire station will include three (3) drive-through apparatus bays, apparatus support spaces, public lobby, meeting room, accessible restroom and a station office. The second level will include private sleeping quarters, kitchen, dining, dayrooms, fitness room, mechanical, electrical and communications rooms. The site improvements will include landscaping, provision for eleven (11) secure parking spaces, EV charging station, fencing, automated sliding gates, washdown area for apparatus vehicles. Offsite improvements will include new traffic signals at the Long Beach Blvd. / Randolph Place intersection, replacement of sidewalks, new sidewalk landscaping and repairs to the alley and Randolph Place.

Bids are required for the entire Work, indicated on the Drawings and Specifications

LONG BEACH SMALL BUSINESS ENTERPRISE (LBSBE) PROGRAM: Bidders are advised that this project is subject to the City's Small Business (SBE), Very Small Business, (VSBE), and Local Small Business (LSBE) Enterprise Program ("LBSBE Program") established by City Ordinance no. ORD 11-0010. A 10.14 % combined SBE/VSBEL/LSBE goal has been assigned to this project. See Division C of the Specifications for LBSBE program bidder instructions and attachments.

PROJECT LABOR AGREEMENT (PLA): The Work is covered by a Citywide Project Labor Agreement (PLA) entered into by the City of Long Beach with the Los Angeles/Orange Counties Building and Construction Trades Council and the signatory

Craft Unions. The PLA establishes the labor relations Policies and Procedures for the City, the Contractor and subcontractors awarded contracts for the work and for the craft persons employed by the Contractor or subcontractor while engaged in the Work. Refer to Division E of the specifications for the applicable PLA.

CONTRACTOR'S LICENSE: The Contractor shall possess a valid California Class A or B Contractor license at the time of contract award. The City may deem any Bidder who fails to possess the required license to be non-responsive.

MINIMUM QUALIFICATIONS: Please note that for this Work, minimum qualifications apply. The Contractor, as a Prime Contractor for a public agency, must have completed at least two (2) projects of similar type to this project within the last five (5) calendar years. Bidders are required to complete the Bidders Qualification Form and submit as part of the Bid Package.

PLANS AND SPECIFICATIONS: Plans and specifications are posted on the City's website at the URL noted in "Receipt of Bids" above and are available for free download, however, you must be registered (registration is free and may be accomplished at the same URL) and logged in to view or download the documents.

BID SECURITY: Bidders must **scan and upload** with their bid documents a certified check or bank draft payable to the City of Long Beach, drawn on a solvent bank in the United States of America, or a satisfactory bond in an amount not less than ten (10) percent of the Bid. The **original** of the above instrument shall be submitted to the City Clerk in a sealed envelope and **must be received and time/date stamped by the City Clerk's Office no later than the time and date stated for receipt of bids.** The outside of the envelope shall clearly state "Bid Security for **Project # 3005010108, (R-7206, B-4797), Fire Station 9 Project, DO NOT OPEN WITH REGULAR MAIL.**" The City Clerk's Office is located at 411 W. Ocean Blvd, 1st Floor, Long Beach, CA 90802. Bidders may proceed directly to Window 12 without pulling a service ticket.

The bid security shall serve as a guarantee that the Bidder, if awarded the Contract, will execute and deliver to the City Engineer, no later than fifteen (15) calendar days after the date shown on the "Notice of Award," the following items:

1. The Contract for doing the work, and
2. A corporate surety bond in favor of the City of Long Beach in an amount not less than 100 percent of the Contract price for the faithful performance of the Contract, and
3. A corporate surety bond in an amount not less than 100 percent of the Contract price for the payment of all labor and material claims, and
4. Evidence of required insurance coverage.

Failure to submit the items noted above when specified may result in the City, in its sole discretion, declaring the Bid Security forfeited and depositing same into the City Treasury.

The City will retain the Bid security accompanying all Bids until it awards the Contract. The City will retain the Bid security submitted with the Bid of the Bidder to whom an award of Contract is made, and the Bid security of the next higher Bid, until the Contract between the Bidder to whom award of the Contract is made and the City has been executed.

RETENTION: In the event the contract to be awarded hereunder, including Specifications and other documents incorporated therein by reference, provides for the withholding of monies by the City to ensure performance of such contract, the Contractor may: a) deposit with the City as a substitute for said monies, securities listed in Section 16430 of the California Government Code or bank or savings and loan certificates of deposit, or both, equivalent to the amount withheld; or b), request payment of retentions earned directly to the escrow agent at the expense of the contractor, provided Contractor requests, in writing, to make such substitution within 5 days of the date of the Notice of Award of the Contract and bears all expenses in connection therewith. Either option shall be in accordance with Public Contract Code Section 22300.

CALIFORNIA WAGE RATE REQUIREMENTS: This project is a public work under Labor Code § 1720 et seq. Pursuant to Division 2, Part 7, Chapter 1 of the Labor Code of the State of California, the Director of Public Works of the City by and on behalf of the City Council has obtained from the Director of the Department of Industrial Relations of the State of California the general prevailing rate of per diem wages, and the general prevailing rate of holiday and overtime work in the locality in which the public work is to be performed for each craft, classification or type of workers needed to perform the Work. Copies of prevailing rate of per diem wages are on file in the office of the City Engineer, 5th floor, City Hall, 411 West Ocean Boulevard, Long Beach, California 90802, and shall be made available upon request. Copies may also be obtained on the California Department of Industrial Relations website <http://www.dir.ca.gov/dlsr>. This project will be subject the **2023-2 prevailing wage** rate, as determined by the Director of the Department of Industrial Relations for the State of California. The Contractor to whom the Contract is awarded, and its subcontractors is directed to pay not less than the general rate of per diem wages for each craft, classification, or type of worker needed to execute the contract. Contractor is required to post a copy of the determination of the director of the prevailing rate of per diem wages at each job site.

Contractors are required to pay at least the California minimum wage for the basic hourly rate in all cases where the published prevailing wage rate is below the California minimum wage. Any and all employer payments required by the prevailing wage determinations must also be paid. If the California minimum wage is increased in the future to an amount above that shown in the prevailing wage determination, the basic hourly rate in that determination automatically increases to the new minimum wage.

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) COMPLIANCE: This project is subject to the following: No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with

limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)]. No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5. This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. Contractors are further cautioned that certified payrolls shall be submitted electronically directly to the Department of Industrial Relations.

CERTIFIED PAYROLL SUBMISSION TO THE CITY OF LONG BEACH: Pursuant to the provisions of Labor Code Section 1776, Contractor shall keep and shall cause each subcontractor performing any portion of the work under this Contract to keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by Contractor or subcontractor in connection with the work. Such payroll records for the Contractor and/or subcontractor shall be certified and shall be available for inspection at all reasonable hours at the principal office of the Contractor pursuant to the provisions of 1776 of the Labor Code. Contractor's failure to furnish such records to City or City's authorized Labor Compliance representative in the manner provided herein for notices shall entitle City to withhold the penalty prescribed by law from progress payments due to Contractor.

Each contractor and every subcontractor and supplier shall be required to submit certified payrolls and labor compliance documentation electronically at the discretion of and the manner specified by the City of Long Beach. Electronic submittal will be a web-based system, accessed on the World Wide Web by a web browser. Each contractor and subcontractor will be given a Log On identification and password to access the City of Long Beach reporting system. The foregoing is in addition to, and not in lieu of, any other requirements or obligations established and imposed by any department of the City with regard to submission and retention of certified payroll records for Contractor and subcontractors.

APPRENTICESHIP EMPLOYMENT: The Contractor shall comply with Section 1777.5 of the Labor Code concerning the employment of apprentices by the Contractor or any subcontractor under the Contractor and, by submitting a Bid and executing the Contract, the Contractor stipulates that it shall so comply. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

PENALTIES: Contractor and subcontractors are subject to penalties, including, but not limited to, under Labor Code §§ 1775, 1776, 1777.7 and 1813, for failure to comply with Sections 13.28 through 13.31 and/or Labor Code § 1720 et seq.

(SEAL)

/s/ MONIQUE DE LA GARZA
CITY CLERK, CITY OF LONG BEACH, CALIFORNIA

DATE

/s/ THOMAS B. MODICA
CITY MANAGER

End of Division A – Notice Inviting Bids

DIVISION B
INSTRUCTIONS TO
BIDDERS

DIVISION B

INSTRUCTIONS TO BIDDERS

Please read these instructions carefully. If you do not submit a complete Bid, the City may determine that your Bid is non-responsive, in which case the City will reject your Bid.

ATTENDANCE AT A MANDATORY PRE-BID CONFERENCE: Entry of bid amounts will be accomplished electronically. Bids prices submitted on a paper bid form will not be accepted. Bidders are strongly encouraged to send an individual who is responsible for the bid, and not a runner. Bid submission processes and how to access the bidding system will be discussed at the pre-bid conference. Attendance at the pre-bid conference is mandatory. Failure to attend the pre-bid conference shall be cause for rejection of the bid. Refer to Division “A” for pre-bid conference date and time.

SUBMISSION OF BID: The bid shall be submitted online at <https://longbeachbuys.buyspeed.com/bsol/> at keyword Project R-7206. Bidders must be registered on the City’s portal to access the bidding page and to download the plans and specifications. All documents to be submitted with the bid are contained in Division C of this Specification; these documents shall be scanned and uploaded with the bid. The originals of the Bidder’s Bond, and any other document which may require notarization, must be placed in a sealed envelope, clearly marked on the outside with “Project # 3005010108, (R-7206 & B-4797), FIRE STATION 9, DO NOT OPEN WITH REGULAR MAIL,” and these originals must be received by the City Clerk at the address shown in the Notice Inviting Bids by the time and date stated therein. These originals may be mailed or sent via package delivery service to City of Long Beach, 411 W. Ocean Blvd, Attn: City Clerk, Long Beach, CA 90802, but the City is not responsible for lost or misdirected mail. The City Clerk’s time-stamp clock is the official time for receipt of documents.

PROJECT LABOR AGREEMENT: This work is covered by a Citywide Project Labor Agreement (PLA) entered into by the City of Long Beach with the Los Angeles/Orange Counties Building and Construction Trades Council and the signatory Craft Unions. The PLA establishes the labor relations Policies and Procedures for the City, the Contractor and subcontractors awarded contracts for the Work and for the craft persons employed by the Contractor or subcontractor while engaged in the Work.

The work covered by this Agreement shall be limited to any and all demolition, construction and rehabilitation work pursuant to prime multi-trade and specialty contracts and all subcontracts, of whatever tier, entered into by the City that exceed \$750,000 for non-street/right of way projects and \$1,000,000 for street/right of way projects.

The goal of the PLA is to provide that the Work bring full employment and economic benefit to the City and its residents. With the PLA, the parties have established a framework for fair wages, hours and working conditions through which these goals may be achieved, and which will permit the utilization of the most modern, efficient and

effective procedures for construction, assure a sufficient supply of skilled craft persons, and reduce or eliminate the causes of disruptions or interference with the Work.

The PLA contains a local hiring goal of 40%, calculated based on total hours worked. The local hire provision requires best efforts to utilize qualified workers residing in first tier zip codes (which include all of the City of Long Beach), then in second tier zip codes (which reflect the Gateway Cities), and finally in Los Angeles and Orange Counties. In addition, there is a provision with a goal of 10% to hire Transitional Workers and Veterans. The term Local Resident, as used herein, shall mean an individual whose primary place residence is within the Counties of Los Angeles or Orange. The City of Long Beach will utilize and contract with a PLA Administrator who will work with the contractors, residents, Long Beach City College, Pacific Gateway, and the Trades to oversee the provisions of the Agreement. Additionally, the general contractor will be required to hire a "Jobs Coordinator" to provide additional outreach efforts connecting Long Beach residents to job opportunities. The term Jobs Coordinator means an independent third-party individual, entity, or employee with whom the prime contractor enters into a contract or employs to facilitate implementation of the targeted hiring requirements of the PLA.

This Work will provide many opportunities for local residents and local small business enterprises to participate. It is the City's policy that contractors will cooperate with all efforts of the City, the PLA Administrator, the Jobs Coordinator (if applicable), and other organizations retained by the City to encourage and assist in the participation of local residents and local small businesses in the Work.

Contractor will be required to sign a Letter of Assent to acknowledge and agree to comply with all provisions of the PLA. Refer to Division E of the specifications for the applicable PLA and Letter of Assent.

EXAMINATION OF SITE AND WORK: Each Bidder must fully inform itself of the conditions relating to the Work and the employment of labor for the Work. A Contractor's failure to do so will not relieve it of the obligation to furnish all material and labor necessary to complete the Work.

TIME FOR COMPLETION: The Work must be completed within **540** calendar days after the commencement date stated in the Notice to Proceed. This is inclusive of all submittals, material procurement, and execution of the Work.

CONTACT: Before the Bid opening, prospective Bidders shall direct any communications regarding this Work to:

City of Long Beach, Department of Public Works
Office of the City Engineer, Bureau of Engineering
5th Floor, City Hall
411 W. Ocean Boulevard
Long Beach, CA 90802
Attention: Derry Mac Mahon
E-mail: dmacmahon@koacorp.com

Communications may be written or oral, but the City is not bound by any oral interpretation of the Contract Documents made by any City employee, nor does the City guarantee the accurate transcription of oral questions.

PROPRIETARY INFORMATION: Responses to the Notice Inviting Bids become the exclusive property of the City of Long Beach. All Bids submitted in response to the Notice Inviting Bids are a matter of public record and shall be regarded as public records. Exceptions will be those elements in each Bid that are defined by the Bidder as business or trade secrets and are marked as "Trade Secrets," "Confidential," or "Proprietary."

The City shall not be liable or responsible in any way for disclosure of any records not marked as "Trade Secrets," "Confidential," or "Proprietary." The City shall not be liable or responsible in any way for disclosure of any records so marked if disclosure is deemed to be required by law or by a court order.

BIDS SHALL REMAIN OPEN: The Bidder shall guarantee the Total Bid Price for 120 calendar days after the Bid opening.

INTERPRETATION AND MISUNDERSTANDINGS OF PLANS AND DOCUMENTS, REQUESTS FOR INFORMATION (RFI's): Bidders may submit to the Engineer written requests for interpretation or correction of the Plans, Specifications or other Contract Documents. Bidders shall not make such requests later than fourteen (14) calendar days prior to the date of Bid opening. Bidders submitting such requests are responsible for their timely delivery. The Engineer will interpret or correct the Contract Documents only by a written Addendum, and such Addenda will be posted to the web address noted in Division A. The City is not bound by any oral interpretation of the Contract Documents made by any City employee.

If Bidder fails to raise any issue regarding such interpretation or correction or if the Engineer fails to respond to a request, Bidder will be deemed to have accepted all risks associated with that issue. Bidder specifically waives the right to request a Change Order, equitable adjustment, or to request additional time, or to seek recovery in quantum meruit in conjunction with any such issue. Bidder further waives the right to assert arguments of estoppel or implied or express warranty of design with regard to any such issue.

ITEM EQUIVALENCY: Any Bidder desiring to bid an "approved equal" item shall submit a request to do so to the Engineer in writing no later than fourteen (14) calendar days prior to the date of the Bid opening. The request shall include all data necessary to substantiate that the item is equal. The Engineer will notify the Bidder, in writing, of approval or disapproval of the proposed item no later than five (5) calendar days prior to the date of the Bid opening. Submit written approvals with your Bid.

EQUAL EMPLOYMENT OPPORTUNITY: The City of Long Beach is an equal opportunity employer and requires all Bidders to comply with policies and regulations concerning equal employment opportunity.

IRAN CONTRACTING ACT: In accordance with California Public Contracting Code Section 2200-2208, all bidders submitting proposals for, entering into, or renewing contracts with the City and estimated at \$1,000,000 or more are required to complete, sign and submit the “Iran Contracting Act of 2010 Compliance Affidavit” contained in Division C.

TAXES: Bidders shall not mention Sales Tax, Use Tax, or any other tax in their Bids. All Bid amounts will be deemed to include such taxes.

BID PREPARATION: The Bid Form included in Division C is provided to assist Bidders in the preparation of their bid, but bids shall be entered electronically as directed above and in Division A. Bidders shall complete all items of the Bid. If the Bidder fails to enter a unit price and enters only an item total, then the City will divide the item total by the estimated quantity to arrive at a unit price, and the Bidder shall be bound by that unit price. The Unit Price shall control, regardless of the extended total for that item. If the unit price is less than one cent, Bidders shall include the proper number of zeros.

Bidders shall not modify the Bid in any way. The City will not consider substitutions except as described in “Item Equivalency”.

Bidders shall provide a Bid for the base Bid and, as directed by instructions on the Bid Document, a separate Bid for each of the alternates.

The electronic bidding system will total the amount bid. The TOTAL AMOUNT BID is informational only may be used by the City for comparison in determining the apparent low Bid at the time of Bid opening. The sum of the mathematically correct extended totals for each item under the ITEM TOTAL column shall be deemed the Bidder’s intended Bid. Any errors shall, at the option of the City, constitute grounds for the City’s rejection of the Bid.

Bidders are cautioned that the electronic bidding system will cease allowing entry at the time stated for bid opening, regardless of when entry was begun. Bidders are reminded to begin bid submission with sufficient time to complete the entries.

The City will not consider oral, telephonic, fax, or paper Bids.

Bidders shall sign the Bidder Information / Signature Form properly, in longhand.

The City will not consider any Bid that does not meet these requirements.

LISTING SUBCONTRACTORS: Submit the list of subcontractors on this Project that is required by the Subletting and Subcontracting Fair Practices Act (Public Contract Code Section 4100, et. seq.). Failure to list a subcontractor for an item of work at time of bid is an acknowledgement that the bidder will perform such work with its own forces.

ADDENDA ACKNOWLEDGEMENT: All Addenda issued before the time Bids are due shall form a part of the Contract Documents. It is the Bidders’ responsibility to determine what Addenda are issued. Bidders may do so by accessing the website shown in Division A. The City may deem any Bid that fails to acknowledge all Addenda to be non-responsive. Bidders must acknowledge the Addenda online prior to submitting their bid.

BID SECURITY: Bidders shall include with their Bids in the manner described above the security shown in the Notice Inviting Bids. The City will reject any Bid not accompanied by such Bid security.

DELIVERY OF BID: Bidders shall input their bids online via the City's bidding portal. No paper bids will accepted.

WITHDRAWAL OF BIDS: Bidders may withdraw their Bids before the time set for the Bid opening in the Notice Inviting Bids. Bidders may not withdraw their Bids after that time without forfeiture of the Bid security. Withdrawal of the Bid will not prejudice any Bidder's right to submit a new Bid, if there is time to do so.

LATE BIDS: The City will reject, and the bidding system will not allow, any Bid received after the time set for the Bid opening whether or not the Bids are opened exactly at the time set in the Notice Inviting Bids.

TELEPHONES: The City does not provide telephones for use by Bidders.

BID ALTERNATES: Please see the Bid form.

BID OPENING: All Bids timely received will be subject to further evaluation with respect to:

- The responsiveness of the Bid
- Determination that Bidder is responsible

AWARD OF CONTRACT AND OWNER'S RIGHTS RESERVED: If the City awards the Contract, it will award the Contract to the lowest responsible Bidder as determined solely by the City. The City Engineer reserves the right to reject any or all Bids, and, to the extent not prohibited by law, to waive any minor irregularity or informality in any Bid that does not give the Bidder a competitive advantage over other Bidders and to take the Bids under advisement for the Bid guarantee period shown above, as may be necessary in the best interests of the City.

End of Division B - Instructions to Bidders

DIVISION C
BID DOCUMENTS

BIDDER'S NAME: _____

**BID TO THE CITY OF LONG BEACH
FIRE STATION 9 AT 4101 LONG BEACH BLVD.**

In accordance with the Notice Inviting Bids for this Work in the City of Long Beach, California, to be opened on DECEMBER 6, 2023, at 3:00 p.m., we offer to furnish all necessary labor, tools, materials, appliances and equipment for and perform all Work mentioned in the Notice Inviting Bids, in full compliance with Plans (Drawings Set No. B-4797) and Specifications (No. R-7206) at the prices listed below.

We certify that we have examined the site and that the Bid is complete. By signing the Bid, we certify that the Contractor will not submit a claim based on failure to examine the site thoroughly. The base bid total shall be used for determining the lowest bidder.

BASE BID – New Fire Station 9

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE (IN FIGURES)	ITEM TOTAL (IN FIGURES)
1.	Potholing to locate existing underground utilities	1	LS		
2.	Demolition & Abatement	1	LS		
3.	On-site Improvements	1	LS		
4.	Off-site Improvements	1	LS		
5.	Wet and Dry Utilities	1	LS		
6.	New two-story Fire Station with Photovoltaic System	1	LS		
7.	New Traffic Signal System and Striping	1	LS		
	Subtotal:				
8.	Mobilization/Demobilization (No more than 3% of the subtotal of bid items 1 to 7 above)	1	LS		
	Total:				

BASE BID TOTAL _____

We understand that these quantities are estimates only and are given solely for the purpose of facilitating the comparison of Bids, and that the Contractor's compensation will be computed on the basis of the actual quantities in the completed Work.

DO NOT SUBMIT THIS FORM AS YOUR BID. BIDS ARE TO BE SUBMITTED ELECTRONICALLY AS DESCRIBED IN DIVISION B.

(Continued on Next Page)

DO NOT SUBMIT THIS FORM AS YOUR BID. BIDS ARE TO BE SUBMITTED ELECTRONICALLY AS DESCRIBED IN DIVISION B.

(Continued on Next Page)

BIDDER INFORMATION / SIGNATURE

Signature**

Legal Name of Company

Print Name / Title

Names of Other General Partners

State of Incorporation

Names of Other Partners

State Where Registered as LLC

City of Long Beach Business License
Number

Business Address (Actual Address -Not A
Post Office Box)

City of Long Beach Business License
Expiration Date

Telephone Number / Fax Number

Address on City Business License

Email Address of Individual to Contact

Contractor's License Number

DIR Registration Number

**

_____ If Bidder is an individual, set forth his/her signature.

_____ If Bidder is a joint venture, set forth the name of the joint venture with the signature of an authorized representative of each venture.

_____ If Bidder is a general partnership, set forth the signature of the general partner.

_____ If Bidder is a limited partnership, provide names of other partners.

_____ If Bidder is a limited liability company, set forth legal name of company with signature of a member or manager authorized to bind the company

_____ If the Bidder is a corporation, set forth the legal name of the corporation with the signature of an officer of the corporation.

(Continued on Next Page)

The following information will be used for statistical analysis only.

Is the Bidder a Disadvantaged Business (DBE)? ____ If yes, certification No. _____

Is the Bidder a Minority-Owned Business? _____ Which racial minority? _____

Is the Bidder a Women-Owned Business? _____

Is the Bidder a certified Small Business? ____ If yes, certification No. _____

Where did your company first hear about this City of Long Beach Public Works project?

BIDDER'S QUALIFICATIONS

1. ORGANIZATION

- 1.1 How many years has your organization been in business as a licensed Contractor? _____
- 1.2 How many years has your organization been in business under its present name? _____
- 1.2.1 Under what other names has your organization operated? _____
- 1.3 If your organization is a corporation, answer the following:
- 1.3.1 Date of incorporation: _____
- 1.3.2 State of incorporation: _____
- 1.3.3 Corporate ID number: _____
- 1.3.4 President's name: _____
- 1.3.5 Agent for Service of Process: _____
- 1.4 If your organization is a partnership, answer the following:
- 1.4.1 Date of organization: _____
- 1.4.2 Type of partnership (if applicable): _____
- 1.4.3 Name(s) of general partner(s): _____
- 1.5 If your organization is individually owned, answer the following:
- 1.5.1 Date of organization: _____
- 1.5.1 Name of owner: _____

2. LICENSING

- 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business and indicate registration or license numbers, if applicable.
- _____
- _____
- 2.2 In the last 10 years, has your contractor's license been revoked at any time? _____

3. FINANCIAL RESOURCES

3.1 In the past five years, has a bonding company completed a contract on your behalf, or paid for completion because your firm was terminated or found in default? _____

4. EXPERIENCE

4.1 List classifications of work your organization typically performs with its own forces.

4.2 Claims and Suits (If the answer to any of the questions below is yes, please attach specifics.)

4.2.1 Has your organization ever failed to complete any work awarded to it? _____

4.2.2 Are there any judgments, claims, suits or arbitration proceedings pending against your organization or its officers within the last five (5) years, or such actions related to labor compliance, prevailing wages, or the Department of Industrial Relations within said period?

4.2.3 Has your organization filed any law suits or requested arbitration related to construction within the last five (5) years? _____

4.3 Has your firm, or any firm with which any of your company's owners, officers, partners, or employees was associated, been debarred from bidding on, accepting, or performing any government agency or public works project(s), either as a prime contractor or subcontractor? _____

4.4 On a separate sheet, list major construction projects your organization has in progress. Indicate name of the project, project description, Contract amount, owner, architect/engineer, percent complete and scheduled completion.

4.4.1 Indicate total value of work in progress and under Contract: _____

4.5 On a separate sheet, list all projects your organization has completed in the past five years. Indicate name of project, project description, Contract amount, owner, owner's phone number, project manager, completion date, and percentage of the cost of the work performed with your own forces. ('None', 'N/A' or its equivalent is not an acceptable response and will be a basis for disqualifying your bid as non-responsive.)

4.5.1 Indicate average annual value of construction work performed during the past five years:

5. MINIMUM QUALIFICATIONS

5.1 The minimum acceptable experience to be qualified for this project is as follows:

5.1.1 The Contractor, has served as a Prime Contractor for a public agency and must demonstrate a track record of successfully completing at least two (2) projects of comparable scope and nature.

5.1.2 It is a prerequisite that the on-site and off-site management staff of the contractor's team designated to work on this project possess a track record of accomplishment, having successfully completed a minimum of two projects of comparable scope and nature.

5.2 List project(s) to satisfy minimum qualifications noted above. 'None', 'N/A' or its equivalent is not an acceptable response and will be a basis for disqualifying your bid as non-responsive.:

Project Name: _____
Agency/Owner: _____
Project Manager: _____
Phone Number: _____
Contract Amount: _____
Scope of Work: _____

Name of Project: _____
Agency/Owner: _____
Project Manager: _____
Phone Number: _____
Contract Amount: _____
Scope of Work: _____

Name of Project: _____
Agency/Owner: _____
Project Manager: _____
Phone Number: _____
Contract Amount: _____
Scope of Work: _____

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this _____ day of _____, 20____ at _____, California by:

Company/Contractor Name

Signature

Signer's Name (print/type)

Title (print/type)

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" Division 2 Part 1, Chapter 4 of the California Public Contract Code, the Bidder shall set forth hereon the name, the location of the place of business, Department of Industrial Relations registration number, and the California contractor license number of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars (\$10,000), whichever is greater. The prime contractor shall set forth thereon the portion of the work (type and dollar value) that will be done by each subcontractor. The prime contractor shall list only one subcontractor for each portion as defined by the prime contractor in his or her bid. Information requested, other than the sub contractor's name, location of business, contractor license number and the portion of work that will be done by each subcontractor may be submitted by the prime contractor within 24 hours after the deadline for submission of bids.

Name _____ Type of Work _____

Address _____

City _____ Dollar Value of Subcontract \$ _____

Phone No. _____

License No. _____ DIR Registration No. _____

Name _____ Type of Work _____

Address _____

City _____ Dollar Value of Subcontract \$ _____

Phone No. _____

License No. _____ DIR Registration No. _____

Name _____ Type of Work _____

Address _____

City _____ Dollar Value of Subcontract \$ _____

Phone No. _____

License No. _____ DIR Registration No. _____

Name _____ Type of Work _____

Address _____

City _____ Dollar Value of Subcontract \$ _____

Phone No. _____

License No. _____ DIR Registration No. _____

Name _____ Type of Work _____

Address _____

City _____ Dollar Value of Subcontract \$ _____

Phone No. _____

License No. _____ DIR Registration No. _____

Contractor directs the City's attention to Continuous Bidder's Bond (CBB) # _____ CC-LM-C, on file in the office of the City Clerk of the City of Long Beach. If a CBB is not on file, please accept the bidder's bond listed below:

CITY OF LONG BEACH BIDDER'S BOND

KNOW ALL THOSE BY THESE PRESENTS: That we, _____, as Principal, and _____, a corporation, organized and existing under and by virtue of the laws of the State of _____, with its principal place of business in the City of _____, State of _____, with a paid up capital of not less than Two Hundred Fifty Thousand Dollars (\$250,000.00), incorporated, as aforesaid, for the purpose of making, guaranteeing or becoming a surety upon bonds and undertakings required or authorized by law, and having heretofore complied with all of the requirements of the law of the State of California regulating the formation or admission of such corporation to transact business in this State, as Surety, are held firmly bound unto the City of Long Beach, a municipal corporation, organized under the laws of the State of California, and situated in the County of Los Angeles, in the sum of _____ Dollars (\$ _____) lawful money of the United States of America, for the payment whereof the Principal and sureties bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The condition of the above obligation is such that:

If the bid of said Principal shall be accepted by the City of Long Beach and the contract for delivery of goods, materials, equipment or supplies, or for the furnishings of services, materials, supplies, labor and performing work, all as specified in the Specifications, notice inviting bids, and bid is awarded to the Principal, and if Principal shall execute and submit all contract documents and insurance within fifteen (15) calendar days after delivery of them to Principal, and if Principal shall, in connection with said contract, furnish and deliver to the City of Long Beach a good and sufficient faithful performance bond, if required in the notice inviting bids, and a good and sufficient labor and material (payment) bond, if required in the notice inviting bids, with Surety or Sureties, then this obligation shall be void; otherwise it shall remain in full force and effect.

Principal

Surety

The bond shall be signed by both parties and all signatures shall be notarized

USE OF A NON-CITY OF LONG BEACH BID BOND MAY BE CAUSE FOR REJECTION

NONCOLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [Date], at _____ [City], _____ [State].

WORKERS' COMPENSATION CERTIFICATION

In accordance with California Labor Code Sections 1860 and 3700, I certify that I am aware of the provisions of Section 3700 which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with said provisions before commencing the performance of the Work of this contract.

Contractor's Name:

Signature of Contractor, or a corporate officer of Contractor, or a general partner of Contractor

Title: _____

Date: _____

**CITY OF LONG BEACH
CERTIFICATION OF SITE EXAMINATION**

Each bidder shall be fully informed of the conditions relating to the construction of the work and the employment of labor thereon. Failure to do so will not relieve Contractor of the obligation to furnish all material and labor necessary to carry out the provisions of the Contract Documents.

Each bidder shall examine the site for the work described herein. Bidders shall attend a mandatory pre-bid inspection of the building and site, conducted by the City, if specified by the Special Provisions. Failure to attend the mandatory pre-bid inspection shall be cause for rejection of the bid.

This is to certify that I have examined the site and the bid is complete and there will be no additional payment for failure to examine the site thoroughly.

Date of Site Examination

Company

Printed Name of Company Representative

Signature of Representative

Date

INFORMATION TO COMPLY WITH LABOR CODE SEC. 2810

To comply with Labor Code Sec. 2810, Contractor shall complete and submit this Information Sheet which shall be incorporated into and be a part of the Contract:

- 1) Workers' Compensation Insurance:
 - A. Policy Number: _____
 - B. Name of Insurer (**NOT** Broker): _____
 - C. Address of Insurer: _____
 - D. Telephone Number of Insurer: _____
- 2) For vehicles owned by Contractor and used in performing work under this Contract:
 - A. VIN (Vehicle Identification Number): _____
 - B. Automobile Liability Insurance Policy Number: _____
 - C. Name of Insurer (**NOT** Broker): _____
 - D. Address of Insurer: _____
 - E. Telephone Number of Insurer: _____
- 3) Address of Property used to house workers on this Contract, if any: _____

- 4) Estimated total number of workers to be employed on this Contract: _____
- 5) Estimated total wages to be paid those workers: _____
- 6) Dates (or schedule) when those wages will be paid: _____

(Describe schedule: For example, weekly or every other week or monthly)
- 7) Estimated total number of independent contractors to be used on this Contract: _____

- 8) Taxpayer's Identification Number: _____



ATTACHMENT

Debarment, Suspension, Ineligibility Certification

(Please read attached *Acceptance of Certification* and *Instructions for Certification* before completing)

This certification is required by federal regulations implementing Executive Order

1. The potential recipient of Federal assistance funds certifies, by submission of proposal, that:
 - Neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;
 - Have not within three (3) year period preceding this bid/agreement/proposal had a civil judgment rendered against them for commission of fraud or been convicted of a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.
 - Are not presently or previously indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in the above paragraph of this certification; and
 - Have not within a three (3) year period preceding this bid/agreement/proposal had one or more public (Federal, State, or local) transactions terminated for cause of default.
2. Where the potential prospective recipient of Federal assistance funds is unable to certify to any of the statement in this certification, such prospective participant shall attach an explanation to the applicable bid/agreement/proposal.

Signature of Authorized Representative

Title of Authorized Representative

Business/Contractor/ Agency

Date

City of Long Beach
Business Relations – Purchasing Division

Acceptance of Certification

1. This bid/agreement/proposal or like document has the potential to be a recipient of Federal funds. In order to be in compliance with Code of Federal Regulations, the City requires this completed form. By signing and submitting this document, the prospective bidder/proposer is providing the certification and acknowledgement as follows:
2. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549.
3. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective recipient of Federal assistance funds knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
4. The potential recipient of Federal assistance funds agrees by submitting this bid/agreement/proposal or like document that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

Instructions for completing the form, Attachment –Debarment Certification

1. The City of Long Beach sometimes receives Federal funding on certain purchases/projects. To ensure that the City is in compliance with Federal regulations we require this form to be completed.
2. The City of Long Beach checks the System for Award Management at www.sam.gov to confirm that vendors who are awarded City contracts and/or purchase orders are not debarred or suspended. Prospective contractors should perform a search on this website for your company and or persons associated with your business under "Search Records". The finding that "Your search returned no results" is an indicator of compliance.
3. If your business is in compliance with the conditions in the form, please have the appropriate person complete and sign this form and return with your bid/proposal/agreement.
4. If at anytime, your business or persons associated with your business become debarred or suspend, we require that you inform us of this change in status.
5. If there are any exceptions to the certification, please include an attachment. Exceptions will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any exception, indicate to whom it applies, initiating agency and dates of action.

Note: Providing false information may result in criminal prosecution or administrative sanctions.

If you have any questions on how to complete this form, please contact the City of Long Beach, Business Relations, Purchasing Division at 562-570-6200.

CITY OF
LONG BEACH

DEPARTMENT OF FINANCIAL MANAGEMENT
Business Services Bureau

**LONG BEACH
SMALL BUSINESS ENTERPRISE
PROGRAM
(LBSBE PROGRAM)**

PARTICIPATION INSTRUCTIONS

Rev. May 2022

INSTRUCTIONS TO BIDDERS

SUMMARY

The Long Beach Small Business Enterprise Program (“LBSBE Program”) shall apply to all City Manager Departments, in accordance with Ordinance NO. ORD-11-0010, adopted June 7, 2011 and enacted on July 8, 2011.

Each prospective bidder/proposer who is successful in an LBSBE Program-applicable bid to provide goods or services to the City must comply with the City’s LBSBE policy. The City sets project specific combined Small (SBE), Very Small (VSBE) and Local Small (LSBE) goals. Proposers must either demonstrate the intent to meet the goal on the LBSBE Awardee Commitment Plan Form (SBE-2 Form) or show Good Faith Efforts of an attempt to meet the goal. The goal is considered as a percentage of the prime contractor’s base bid.

Prime bidders/proposers are required to submit an SBE-2 Form with their bid or proposal by the required due date to illustrate their intent to meet the combined SBE/VSBE/LSBE project specific goal. A combined goal means that portions of the work must be subcontracted out to a mix of Long Beach Certified SBE, VSBE and/or LSBE contractors. The goal cannot be attained by subcontracting out to only one of the three business enterprise types, it must be a combination of them. The combined total of SBE/VSBE/LSBE contracted work must equal or exceed the assigned goal as compared to the prospective bidder’s base bid. ***To count towards goal attainment, the SBE, VSBE and LSBEs must have a valid, non-expired Long Beach Small Business Enterprise Certification (LBSBE) from either PlanetBids or Long Beach Buys.***

If the prime bidder/proposer commitment plan (SBE-2 Form) does not illustrate intent to meet the combined SBE/VSBE/LSBE project goal, the bidder/proposer is required to submit a Good Faith Effort (GFE), and pass the GFE evaluation, for the bid/proposal to remain responsive.

Bidder/Proposer must submit a signed LBSBE Acknowledgment Form (Attachment A), the SBE-2 LBSBE Awardee Commitment Form (Attachment B), and if applicable, the GFE Form and supporting documents (Attachment C)

The successful prime bidder/proposer will be required to submit a monthly SBE/VSBE/LSBE utilization report to the assigned Labor Compliance Consultant. Staff will review and verify utilization and payments made to small businesses for compliance.

SETTING PROJECT SPECIFIC GOALS

The City Labor Compliance Division will review each bid opportunity (project) to determine whether the LBSBE program will apply and an associated combined goal assigned. Setting a project specific goal consists of the following:

- Evaluation of the engineers estimate to determine whether there are reasonable subcontracting opportunities;

- Review of various databases to determine the availability of SBE subcontractors identified in the subcontracting work areas, by North American Industry Classification System (NAICS) code;
- Review of the historical assignment and achievement of subcontractor utilization on the same/similar projects.

If the City determines that there are sufficient SBEs available in the identified work areas, a mandatory LBSBE combined goal will be set for the project by establishing the percentage of the total contract amount for which a combination of SBE, VSBE and LSBE must be utilized.

Since the LBSBE Program is a mandatory program, Bidders/Proposers are strongly encouraged to attend pre-bid/pre-proposal meetings for projects with LBSBE participation levels so that they will understand the requirements of the LBSBE Program. The City will verify the LBSBE status of the proposed subcontractors, regardless of the dollar amount of work to be performed.

It is important to note that if a Prime Contractor is itself LBSBE certified as an SBE, their participation in the contract will count towards the combined goal. If the Prime Contractor is also a VSBE or LSBE, they will be considered as having met the combined goal so long as their participation in the contract meets or exceeds the assigned percentage.

SBE/VSBE/LSBE GOAL ATTAINMENT

The SBE Participation goal can be achieved in the following manner(s):

- a) **Non-SBE prime contractors/consultants** shall meet the combined SBE/VSBE/LSBE participation goal by subcontracting work to at least two of the following three certification types: SBE, VSBE, LSBE; or document and submit an acceptable good faith effort for their bid or proposal to be deemed responsive.
- b) **SBE prime contractors/consultants** are deemed to have met the SBE component of the combined SBE/VSBE/LSBE participation goal but shall subcontract out to VSBE or LSBE businesses in order to achieve the combined goal, or document and submit an acceptable good faith effort, for their bid or proposal to be deemed responsive.
- c) **VSBE or LSBE prime contractors/consultants** are deemed to have met both components of the combined SBE/VSBE/LSBE participation goal if the percentage of work the Prime participates in is equal to or greater than the project specific goal.

Contractors having demonstrated goal attainment on the SBE-2 form are required to utilize those subcontractors during the project for the annotated amount. Any changes in value or substitutions must be approved by the City. Penalties can be assessed for non-compliance, per City Ordinance [No. ORD 11-0010](#).

SBE/VSBE/LSBE ELIGIBILITY REQUIREMENTS

Only those Small, Very Small and Local Small Business Enterprises with a current and valid City of Long Beach SBE Certification on PlanetBids or Long Beach Buys shall be eligible for the fulfillment of the SBE/VSBE/LSBE participation goal. Vendors will have the “LBSBE” designation on their PlanetBids or Long Beach Buys vendor profile. Listings of LBSBE certified vendors may be obtained from either procurement platform. If a Small Business Enterprise elects to compete for City business without being certified through the PlanetBids system as an LBSBE, they may do so, but any bid submitted will not be counted towards fulfillment of the SBE participation goal. All SBE, VSBE and LSBE businesses should be encouraged to apply for the LBSBE certification over Long Beach Buys.

Prime contractors will be responsible for determining LBSBE and SBE/VSBE/LSBE status of their subcontractors at the time of bid/proposal submission for the purpose of meeting the combined goal. This information will be entered on the SBE-2 form and submitted with the bid. It will be verified by City Labor Compliance staff. The specific categories of work that the applicable contractors will be performing on the project must be relevant from the North American Industry Classification System (NAICS) codes for which they were certified in order to receive combined goal credit.

LONG BEACH SMALL BUSINESS ENTERPRISE PROGRAM CERTIFICATION

An SBE desiring certification with the City of Long Beach must complete the online certification process over Long Beach Buys. The City is no longer certifying or re-certifying vendors over PlanetBids, though we will recognize unexpired PlanetBids certifications towards goal attainment. The online certification process for Long Beach Buys can be viewed at the link below or by visiting the City website, www.longbeach.gov/purchasing and entering the Long Beach Buys portal. Please note printed certificates are not provided over Long Beach Buys, however City Staff will update the vendor’s profile to reflect LBSBE status and applicable NAICS codes after evaluating their application.

[Long Beach Buys Portal](#)

Long Beach Buys will do an initial pre-qualification for SBE certification upon application submittal. If pre-approved, the City Labor Compliance Division, will review the full application and determine final LBSBE certification status. The City will also verify VSBE status during the LBSBE application process and will update the vendor profile as required to reflect the VSBE or “microbusiness” designation.

SBE, VSBE, LSBE QUALIFICATION CRITERIA

The City determines **SBE eligibility** by utilizing federal U.S. Small Business Administration (SBA) size standards either by the average gross annual revenue or by the number of employees, based on North American Industrial Classification System (NAICS) codes. To see if your business qualifies, view the SBA's Table of Small Business Size Standards.

In addition, for a small business to be eligible for certification, the small business must be a for-profit business and must meet the following requirements as set forth from the California Department of General Services:

- Be independently owned and operated
- Not dominant in field of operation
- Principal office located in California
- Owners (officers, if a corporation) domiciled in California; and,

- Including affiliates, be either a business with 100 or fewer employees; A manufacturer with 100 or fewer employees; or, an average annual gross receipts of \$15 million or less, over the last three tax years, unless a larger threshold is provided in the SBA Table of Small Business Size Standards

To count towards the project specific combined goal, the business must have an unexpired City of Long Beach SBE (LBSBE) certification over the PlanetBids or Long Beach Buys vendor portal.

In addition to the SBE requirements above, **VSBE or microbusiness eligibility** is determined utilizing maximum allowable annual gross revenues consistent with those of the State of California's Department of General Services' "micro-business" designation. The current guidelines for this designation can be accessed on the California Department of General Services website. Currently, a small business will automatically be designated as a micro business if gross annual receipts are \$5,000,000 or less or the small business is a manufacturer with 25 or fewer employees.

To count towards the project specific combined goal, the business must also have an unexpired City of Long Beach SBE certification over the PlanetBids or Long Beach Buys vendor portal.

In addition to the SBE requirements above, **Local Small Business Enterprise** eligibility shall be determined by the criteria established in Municipal Code section 2.84.030, subdivisions (1) and (2), which states: The business must have a current, valid business license from the City of Long Beach showing a place of business within City limits; and have a current, valid seller's permit showing a place of business within City limits.

To count towards the project specific combined goal, the business must have an unexpired City of Long Beach SBE certification over the PlanetBids or Long Beach Buys vendor portal.

SBE-2 LBSBE AWARDEE COMMITMENT PLAN FORM

For LBSBE designated contracts or proposals, prime contractors must submit a completed LBSBE Awardee Commitment Plan (COLB FORM SBE-2) to the City of Long Beach as part of their proposal. This form is **Attachment B** of these Participation Instructions. It will list information for each LBSBE Certified SBE, VSBE and LSBE to be used for contract goal satisfaction. This form must be submitted regardless of whether the goal was attained or not. If the goal cannot be attained, a good faith effort explaining why the goal could not be reached shall also be submitted. The Labor Compliance Division will approve the initial SBE commitment or good faith effort submitted by the prime contractor. See Attachment B for further instructions.

During the term of the contract, the awarded contractor will be required to utilize all subcontractors listed on the SBE-2 Form in the amount and percentage specified on the form, unless the City approves a change in the scope of work that would eliminate or reduce the utilization of an SBE, VSBE, or LSBE.

SBE/VSBE/LSBE GOOD FAITH EFFORTS

A bidder/proposer whose bid or proposal fails to meet the combined participation goal shall be found responsive if an acceptable Good Faith Effort is demonstrated. Each of the 10 criteria below will be

assigned 10 points. The bidder/proposer must achieve a score of 70 out of a possible 100 points in order to be determined responsive for GFE. GFE shall be annotated on **Attachment C** of these Bidder Instructions, and submitted as part of the bid along with all supporting documents, as applicable.

1. **Attend Pre-Bid/Pre-Proposal Meeting:** The bidder/proposer must submit written evidence that he/she attended the pre-bid conference or pre-proposal meeting.

Note: To receive credit for attending the pre-bid/proposal meeting, the attendee must be a person who will be directly involved with the project, i.e., owner, project manager, etc. A copy of the sign-in sheet must be submitted. If no pre-proposal meeting is held, the bidder/proposer will receive 10-points credit for this criterion.

2. **Subdivide the Work:** The bidder/proposer must demonstrate that he/she prepared and followed a plan to subdivide the work into disciplines or work elements that could be economically performed by small businesses. It is the bidder's/proposer's responsibility to demonstrate that sufficient work was made available to SBEs, VSBEs and LSBEs to meet project specific LBSBE goal requirements.

Note: The work should be subdivided into categories or disciplines to allow for maximum SBE, VSBE and LSBE participation. For example:

Name of Project: Fuel Tank Replacements

Work Elements include but are not limited to: Hazardous waste collection- 10%; Site preparation 20%; Poured concrete and foundation contractors- 10%; construction equipment rentals: 10%; electrical : 15%; all other specialty contractors: 35%

3. **Advertise:** The bidder/proposer shall submit written evidence of commercial advertising (via web or print) for small business subcontractors/subconsultants at least **14 calendar days** prior to the bid/proposal due date. A copy of the advertisement showing the advertisement date(s), name of publication, type of work and amount of work that is being solicited, must be provided.

Note: A copy of the actual advertisement showing the advertisement date and name of the publications must be provided.

4. **Use Public Databases:** The bidder/proposer must submit written evidence of using the City's LBSBE database, small business, minority business, and women-owned business associations and chambers of commerce, or any other small business database to help solicit subcontractors in the disciplines in which the work was subdivided.

Note: A printout of the list(s) of contractors found in the public database(s) search must be provided, including the database source. Note that if they are not LBSBE certified, they must become certified prior to the bid/proposal due date. Some good sources are:

- a. City of Long Beach PlanetBids

<https://pbsystem.planetbids.com/portal/15810/portal-home>

- b. City of Long Beach Long Beach Buys
<https://longbeachbuys.buyspeed.com/bsv/view/search/external/advancedSearch.xhtml>
- c. Port of Long Beach
<https://pbsystem.planetbids.com/portal/19236/portal-home>
- d. Los Angeles Community College District
<http://www.build-laccd.org/ced/business>
- e. California Unified Certification Program database
<https://californiaucp.dbesystem.com/>

5. **Directly Solicit Small Businesses:** The bidder/proposer must submit written evidence of directly soliciting the small business subcontractors/subconsultants found in the public database search at least 14 calendar days prior to the bid/proposal due date, or as specified by City SBE staff. A copy of the written notices sent directly to each small business must be provided. A direct solicitation should include the company name, project name, scope of work, date of contact, person contacted, amount of work, and a brief specific description of the work being solicited.

Note: Create a contact log to include with your solicitation documents that includes the following information: name of company, name of project, scope of work required, date of contact, method of contact (in-person, phone, fax, email), person contacted, result of contact (waiting for response, waiting for bid/proposal, left message, no answer, etc.). This will help track the follow up in #8 below.

6. **Provide Relevant Information to Interested Small Businesses:** The bidder/proposer must submit written evidence that he/she has provided **interested** small businesses with additional information about the requirements of the contract (i.e. how to obtain plans and specifications, or responded to any project specific questions).

Note: provide a printout of the email conversation showing you responded to Interested Small Businesses inquiries, or summarize phone conversations on a phone log.

7. **Conduct Follow-Up:** The bidder/proposer must submit written evidence of specific activities used to follow up on any unsuccessful initial solicitations from #5 above. A copy of the written follow-up must be provided, or phone conversations annotated on an outreach log.

Note: Follow-up activities must include documentation of repeat contact efforts if the first contact was unsuccessful.

8. **Offer Assistance:** The bidder/proposer must demonstrate that he/she has offered to assist small businesses in obtaining bonding, insurance or equipment.

Note: Submitting the offer to assist with bonding/insurance/equipment included in the ad copy and also in direct written solicitations satisfies this requirement.

9. **Negotiate:** The bidder/proposer must submit written evidence that he/she has negotiated in good faith with interested small businesses. Documentation must include company name, contact person, method of contact, and specific items that were negotiated (scope of work, materials, equipment, insurance, bonding, personnel, timing of project, etc.).

Note: Negotiations include give-and-take by both parties with the intention of reaching a mutually satisfactory agreement. This includes responding in writing to bids/proposals from small businesses.

10. **Document Bid and Negotiation Results:** For any negotiations which were unsuccessful and for any bids/proposals received from subcontractors but not accepted, the bidder/proposer must submit the unsuccessful bidder's/proposer's company name, telephone number, contact person, price bid (if applicable), and the reason for rejecting the bid or proposal. If price is the reason for rejecting the bid/proposal, list the price bid by both the SBE/VSBE/LSBE and the low bidder for that element of work.

Note: For successful bids/proposals, Contractor must submit the name of the successful bidder/proposer(s) on COLB Form SBE-2 Commitment Plan. [Please refer to the ITB or RFP for submittal deadlines.](#)

MONTHLY REPORTING

The Awarded Contractor will utilize a City-designated form to report monthly utilization of LBSBEs as a means of monitoring goal attainment. Contractor shall cooperate with City personnel in providing such information as requested by the City or its assigned Labor Compliance Consultants in order to ensure compliance. A final LBSBE utilization report will be submitted to the City or designee within 15 days of project completion. These forms will be provided to the awardee at the pre-construction meeting.

If an awardee substitutes an SBE/VSBE/LSBE subcontractor, the awardee shall provide proof, to the satisfaction of LBSBE staff, that a good faith effort was made to replace that subcontractor's participation percentage with another SBE/VSBE/LSBE business, to meet the combined SBE/VSBE/LSBE participation percentage specified on the Awardee's Commitment Plan. At project closeout, if the prime Contractor fails to meet the combined SBE/VSBE/LSBE participation percentage specified on its Commitment Plan, or fails to provide proof that it made a good faith effort to do so, the Contractor may be considered to be in material breach of contract.

CONTACT INFORMATION

For questions or assistance, please contact the Labor Compliance Division:

Labor Compliance Division
Department of Financial Management
411 W. Ocean Blvd., 7th Floor
Long Beach, CA 90802
(562) 570-6200 Telephone
Email: sbe@longbeach.gov

**LONG BEACH SBE PROGRAM (LBSBE) ACKNOWLEDGEMENT
REQUIRED OF ALL PROPOSERS/BIDDERS**

(This acknowledgment will become part of the contract for the selected Proposer/Bidder)

Solicitation Name: Long Beach New Fire Station 9 Project

Solicitation Number: _____

This solicitation has the following combined LBSBE Goal 10.14 %:

If awarded the contract, the selected Proposer/Bidder commits to achieving the LBSBE combined goal assigned to the solicitation by committing subcontracts as stated on the SBE-2 LBSBE Commitment Form submitted with the bid/proposal. If the contractor did not demonstrate goal attainment, then Good Faith Efforts shall be completed and submitted with the bid/proposal

The selected Proposer/Bidder's performance towards goal attainment will be monitored throughout the duration of the contract, and the business enterprise achievement levels will be calculated at the end of the contract term.

Any reduction, increase, or other change to the SBE, VSBE, or LSBE Subcontract amounts stated on the submitted SBE-2 LBSBE Commitment Form without prior written approval of the City is considered an unauthorized subcontractor substitution, and the awarded Proposer/Bidder may be subject to a penalty. A subcontract dollar value increased or reduced solely as the result of a Change Order issued by the City to add or delete from the original scope of work shall not be subject to a penalty for an unauthorized subcontractor substitution.

Proposers/Bidders must list all LBSBE program certified subcontractors on the SBE-2 Form and include all requested information. The City will verify subcontractor SBE/VSBE/LSBE status during the responsiveness review.

PENALTIES:

Violation of the LBSBE Program Participation Instructions and Ordinance (ORD-11-0010) may result in financial penalties. The City may withhold up to 10% of a progress payment until the contractor/consultant is brought into compliance.

REPORTING REQUIREMENTS:

The selected Proposer/Bidder shall submit monthly progress reports to the City Labor Compliance Division or their authorized representative. This report will list the SBE, VSBE, and/or LSBE subcontractors utilized during the reporting period. The City will not process or pay selected Proposer/Bidder's subsequent invoices if the Subcontractor Utilization Reports are not submitted monthly as directed by Labor Compliance or their representatives.

The Contractor must submit the Final Subcontracting Report within fifteen (15) calendar days after a request for the report by the City.

Bidder/Proposer shall submit this Attachment A and Attachment B (SBE-2 Form) of these Bidder Instructions with their bid/proposal. If Attachment B does not demonstrate goal attainment, Attachment C (GFE) shall also be submitted with supporting documentation.

CERTIFICATION

The Bidder/Proposer certifies that he/she has read and understood the LBSBE Program Participation Instructions and further certifies that, if awarded the Contract, he/she shall fully comply with the City's LBSBE Program.

Company Name, Address and Phone Number

Signature of Officer or other Authorized Representative

Date

Print Name and Title of Officer or Other Authorized Representative

Project Title / Bid Number

**COLB SBE-2 FORM
LBSBE PROGRAM AWARDEE COMMITMENT PLAN**

SECTION 1

BID #:		Project Name:		Date:	
Combined SBE/VSBE/LSBE Goal % Assigned to Contract:				Prime base bid amount:	\$
Prime Contractor/Consultant Name:					

SECTION 2

If awarded the contract, the Prime commits to subcontracting out to the following LBSBE certified businesses in order to meet or exceed the project specific combined LBSBE goal. If you as the Prime are LBSBE certified, be sure to include your business on the list. You must list all LBSBE certified subcontractors/subconsultants. LBSBE status will be verified by City staff. Fill out all fields. Failure to provide complete and legible information on this form may result in your business not receiving full credit. Utilize multiple copies if needed.

Business Name, City, State, Contact Person, Phone #	Indicate "SBE", "VSBE" and/or, "LSBE"	Indicate if Prime, Sub or Supplier	Brief Description of Work	\$ Value of contract	% of Total Prime Base Bid
<i>Ex #1: ABC Land Surveyors Long Beach, CA Mr. Joe Smith, (562) 555-1212</i>	<i>VSBE,LSBE</i>	<i>1st tier sub</i>	<i>Land surveying</i>	<i>\$100,000</i>	<i>20%</i>
TOTAL:				\$ _____	_____ %

Responses to the following questions will be verified by City Staff:

- | | | |
|---|-----|----|
| 1) Have you committed to subcontracting out to a COMBINATION of SBE, VSBE, and LSBE businesses? | Yes | No |
| 2) Have you demonstrated attaining the project specific LBSBE goal ? | Yes | No |
| 3) If no to #2 above, did you submit Good Faith Effort as part of your bid/proposal? | Yes | No |

Completed by: Bidder/Proposer Contact (please print or type)	Phone #
Signature	Date
	Email

**INSTRUCTIONS FOR COLB SBE-2 FORM:
LBSBE PROGRAM AWARDEE COMMITMENT PLAN**

SECTION 1:

Bid# - The number assigned to the bid.

Project Name - The name of the project (usually the bid/RFP title).

Date - The date the form is being filled out.

Combined SBE/VSBE/LSBE Goal % - The LBSBE goal assigned to the procurement, as stated in the LBSBE Participation Instructions.

Base Bid Amount - The total amount the bidder/proposer proposed for the project.

Prime Contractor/Consultant Business Name - Legal name of the business completing the form and submitting the bid/proposal.

SECTION 2:

1. List all Long Beach SBE Program (LBSBE) certified SBE/VSBE/LSBE subcontractors, vendors, suppliers, and other businesses that will render materials or services under this contract. If the prime contractor is an LBSBE certified SBE/VSBE/LSBE, list the prime first.
2. Completely fill out all fields - Ensure accuracy of subcontract amounts. This SBE-2 Form will be referred to throughout the life of the contract as your Commitment Plan. Awardee will be required to submit monthly reports demonstrating utilization and payment to the contractors listed.
3. For a business to be counted toward meeting the SBE/VSBE/LSBE goals, the business must be SBE certified on the City's online vendor database *Long Beach Buys*, or have a valid, unexpired PlanetBids LBSBE certification.
4. The prime contractor must verify the current eligibility status of each SBE/VSBE/LSBE, prior to listing the business(s) on the Commitment Plan. This can be done by locating the business on the City's Long Beach Buys platform and viewing their certifications.
5. The City does NOT issue VSBE certifications; VSBE eligibility will be reviewed and determined upon submittal of the Commitment Plan. VSBE status can be determined by viewing the businesses vendor profile on Long Beach Buys.
6. LSBE's will have "local" designation on their vendor profile, or will show Long Beach as the business location on the vendor profile.
7. The City reserves the right to request proof of payment from the prime contractor/subcontractor to the lower tier sub/vendor/supplier prior to contract close-out.
8. All SBEs/VSBEs/LSBEs, regardless of tier, MUST be LBSBE certified for the materials/services (NAICS Codes) that they will be rendering for the contract. All SBEs/VSBEs/LSBEs, regardless of tier, MUST provide materials/services directly applicable to the contract.
9. Use multiple copies of this form if necessary

City of Long Beach LBSBE Program

Good Faith Effort (GFE) and Statement of GFE Compliance

Business Name:	
Project Name:	
Bid Number:	

If a Bidder/Proposer has not fully met the **established combined LBSBE goal** for this project, then the Bidder/Proposer must document it has met the GFE requirements by completing this Form and providing supporting documentation. Detailed information of the City's GFE requirements can be found in City LBSBE Program Participation Instructions included with the bid. The Bidder must submit the GFE with their bid/proposal if they were not able to meet the goal. Failure to do so constitutes grounds for rejection of the Bid. Below is a list of Good Faith Efforts as defined in the LBSBE Program Participation Instructions. Each item is worth 10 points. A Bidder must receive at least 70 of a total of 100 points to be found responsive for the LBSBE program if they have not demonstrated meeting the project specific LBSBE goal on the SBE-2 form. Please place an "X" in the first column for each item you are claiming credit. Failure to achieve the minimum number of Good Faith Efforts points stated in the box below constitutes grounds for rejection of your bid.

NOTE: All actions necessary to earn GFE Points must be undertaken prior to Bid Opening.

Total Available GFE Points is: 100

Minimum Number of GFE Points Required for responsiveness: 70

Points	Good Faith Effort (GFE)
<input type="checkbox"/> 10	Attend the Pre-bid/Pre-Proposal Meeting. The bidder/proposer must submit written evidence that he/she attended the pre-bid conference or pre-proposal meeting.
<input type="checkbox"/> 10	Subdivide the Work. The Bidder must demonstrate to the City's satisfaction that it broke down or combined elements of work into economically feasible units to facilitate SBE, VSBE and LSBE participation. In awarding points the City will consider the number and dollar value of the scopes of work the Bidder listed in its GFE supporting documentation and whether those scopes would be sufficient to meet the established Subcontracting Goal. Simply restating the City's subcontracting scopes as listed in the City's Solicitation Documents is insufficient.
<input type="checkbox"/> 10	Advertise. The bidder/proposer shall submit written evidence of commercial advertising (via web or print) for small business subcontractors/subconsultants at least 14 calendar days prior to the bid/proposal due date. A copy of the advertisement showing the advertisement date(s), name of publication, type of work and amount of work that is being solicited, must be provided.
<input type="checkbox"/> 10	Use Public Databases. The bidder/proposer must submit written evidence of using the City's LBSBE database and/or other small business databases; minority business, and women-owned business associations and/or chambers of commerce to help solicit subcontractors in the disciplines the work was subdivided out to.
<input type="checkbox"/> 10	Directly Solicit Small Businesses. The bidder/proposer must submit written evidence of directly soliciting the small business subcontractors/subconsultants found in the public database search at least 14 calendar days prior to the bid/proposal due date, or as specified by City SBE staff. A copy of the written notices sent directly to each small business must be provided. A direct solicitation should include the company name, project name, scope of work, date of contact, person contacted, amount of work, and a brief specific description of the work being solicited.

<input type="checkbox"/>	10	Provide Relevant Information to Interested Small Businesses. The bidder/proposer must submit written evidence that he/she has provided interested small businesses with additional information about the requirements of the contract, how to obtain plans and specifications, and responded to any project specific questions.
<input type="checkbox"/>	10	Conduct Follow-Up: The bidder/proposer must submit written evidence of specific activities used to follow up on any unsuccessful initial solicitations from the Direct Solicitations above. A copy of the written follow-up must be provided, or phone conversations annotated on an outreach log. This GFE is not valid unless the "Directly Solicit Small Businesses" GFE has been completed.
<input type="checkbox"/>	10	Offer Assistance. The bidder/proposer must demonstrate that he/she has offered to assist small businesses in obtaining bonding, insurance or equipment. This can be satisfied by publishing assistance in the add, or by directly offering assistance in your outreach and solicitations.
<input type="checkbox"/>	10	Negotiate. The bidder/proposer must submit written evidence that he/she has negotiated in good faith with interested small businesses. Documentation must include company name, contact person, method of contact, and specific items that were negotiated (scope of work, materials, equipment, insurance, bonding, personnel, timing of project, etc.).
<input type="checkbox"/>	10	Document Bid and Negotiation Results. For any negotiations which were unsuccessful and/or bids/proposals received but not accepted, the bidder/proposer submitted the unsuccessful bidder's/proposer's company name, telephone number, contact person, price bid (if applicable), and the reason for rejecting the bid or proposal. If price is the reason for rejecting the bid/proposal, list the price bid by both the SBE/VSBE/LSBE and the low bidder for that element of work.

Refer to the LBSBE Program Participation Instructions for more details on GFE.

Total GFE Points (Claimed by Bidder)_____

Bidder/Proposer Representative:_____

Bidder/Proposer Signature:_____

Date:_____ Bids Due:_____

**CERTIFICATION OF COMPLIANCE WITH THE
EQUAL BENEFITS ORDINANCE**

Section 1. CONTRACTOR/VENDOR INFORMATION

Name: _____ Federal Tax ID No.: _____
Address: _____
City: _____ State: _____ ZIP: _____
Contact Person: _____ Telephone: _____
Email: _____ Fax: _____

Section 2. COMPLIANCE QUESTIONS

- A. The EBO is inapplicable to this Contract because the Contractor/Vendor has no employees. Yes No
- B. Does your company provide (or make available at the employees' expense) any employee benefits? Yes No
(If "yes," proceed to Question C. If "no," proceed to section 5, as the EBO does not apply to you.)
- C. Does your company provide (or make available at the employees' expense) any benefits to the spouse of an employee?
 Yes No
- D. Does your company provide (or make available at the employees' expense) any benefits to the domestic partner of an employee?
 Yes No (If you answered "no" to both questions C and D, proceed to section 5, as the EBO is not applicable to this contract. If you answered "yes" to both Questions C and D, please continue to Question E. If you answered "yes" to Question C and "no" to Question D, please continue to section 3.)
- E. Are the benefits that are available to the spouse of an employee identical to the benefits that are available to the domestic partner of an employee?
 Yes No
(If "yes," proceed to section 4, as you are in compliance with the EBO. If "no," continue to section 3.)

Section 3. PROVISIONAL COMPLIANCE

A. Contractor/Vendor is not in compliance with the EBO now but will comply by the following date:

_____ By the first effective date after the first open enrollment process following the contract start date, not to exceed two years, if the Contractor/Vendor submits evidence of taking reasonable measures to comply with the EBO;
or

_____ At such time that the administrative steps can be taken to incorporate nondiscrimination in benefits in the Contractor/vendor's infrastructure, not to exceed three months; or

_____ Upon expiration of the contractor's current collective bargaining agreement(s).

B. If you have taken all reasonable measures to comply with the EBO but are unable to do so, do you agree to provide employees with a cash equivalent? (The cash equivalent is the amount of money your company pays for spousal benefits that are unavailable for domestic partners.)

____ Yes ____ No

Section 4. REQUIRED DOCUMENTATION

At time of issuance of purchase order or contract award, you may be required by the City to provide documentation (copy of employee handbook, eligibility statement from your plans, insurance provider statement, etc.) to verify that you do not discriminate in the provision of benefits.

Section 5. CERTIFICATION

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that I am authorized to bind this entity contractually. By signing this certification, I further agree to comply with all additional obligations of the Equal Benefits Ordinance that are set forth in the Long Beach Municipal Code and in the terms of the contract or purchase order with the City.

Executed this ____ day of _____, 20__, at _____, _____

Name: _____ Signature: _____

Title: _____ Federal Tax ID No.: _____

EQUAL BENEFITS ORDINANCE DISCLOSURE FORM

As a condition of being awarded a contract with the City of Long Beach ("City"), the selected Contractor/Vendor ("Contractor") may be required during the performance of the Contract, to comply with the City's nondiscrimination provisions of the Equal Benefits Ordinance ("EBO") set forth in the Long Beach Municipal Code section 2.73 et seq. The EBO requires that during the performance of the contract, the Contractor shall provide equal benefits to its employees with spouses and employees with domestic partners. Benefits include but are not limited to, health benefits, bereavement leave, family medical leave, membership and membership discounts, moving expenses, retirement benefits and travel benefits. A cash equivalent payment is permitted if an employer has made all reasonable efforts to provide domestic partners with access to benefits but is unable to do so. A situation in which a cash equivalent payment might be used if where the employer has difficulty finding an insurance provider that is willing to provide domestic partner benefits.

The EBO is applicable to the following employers:

- For-profit employers that have a contract with the City for the purchase of goods, services, public works or improvements and other construction projects in the amount of \$100,000 or more
- For-profit entities that generate \$350,000 or more in annual gross receipts leasing City property pursuant to a written agreement for a term exceeding 29 days in any calendar year

Contractors who are subject to the EBO must certify to the City before execution of the contract that they are in compliance with the EBO by completing the EBO Certification Form, attached, or that they have been issued a waiver by the City. Contractors must also allow authorized City representatives access to records so the City can verify compliance with the EBO.

The EBO includes provisions that address difficulties associated with implementing procedures to comply with the EBO. Contractors can delay implementation of procedures to comply with the EBO in the following circumstances:

- 1) By the first effective date after the first open enrollment process following the contract start date, not to exceed two years, if the Contractor/Vendor submits evidence of taking reasonable measures to comply with the EBO; or

- 2) At such time that the administrative steps can be taken to incorporate nondiscrimination in benefits in the Contractor/Vendor's infrastructure, not to exceed three months; or
- 3) Upon expiration of the Contractor's current collective bargaining agreement(s).

Compliance with the EBO

If a Contractor has not received a waiver from complying with the EBO and the timeframe within which it can delay implementation has expired but it has failed to comply with the EBO, the Contractor may be deemed to be in material breach of the Contract. In the event of a material breach, the City may cancel, terminate or suspend the City agreement, in whole or in part. The City also may deem the Contractor an irresponsible bidder and disqualify the Contractor from contracting with the City for a period of three years. In addition, the City may assess liquidated damages against the Contractor which may be deducted from money otherwise due the Contractor. The City may also pursue any other remedies available at law or in equity.

By my signature below, I acknowledge that the Contractor understands that to the extent it is subject to the provisions of the Long Beach Municipal Code section 2.73, the Contractor shall comply with this provision.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

Business Entity Name: _____

IRAN CONTRACTING ACT OF 2010 COMPLIANCE AFFIDAVIT

(California Public Contract Code Sections 2200-2208)

The California Legislature adopted the Iran Contracting Act of 2010 to respond to policies of Iran in a uniform fashion (PCC § 2201(q)). The Iran Contracting Act prohibits bidders engaged in investment activities in Iran from bidding on, submitting proposals for, or entering into or renewing contracts with public entities for goods and services of one million dollars (\$1,000,000) or more (PCC § 2203(a)). A bidder who "engages in investment activities in Iran" is defined as either:

1. A bidder providing goods or services of twenty million dollars (\$20,000,000) or more in the energy sector of Iran, including provision of oil or liquefied natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquefied natural gas, for the energy sector of Iran; **or**
2. A bidder that is a financial institution (as that term is defined in 50 U.S.C. § 1701) that extends twenty million dollars (\$20,000,000) or more in credit to another person, for 45 days or more, if that person will use the credit to provide goods or services in the energy sector in Iran and is identified on a list created by the California Department of General Services (DGS) pursuant to PCC § 2203(b) as a person engaging in the investment activities in Iran.

The bidder shall certify that at the time of submitting a bid for new contract or renewal of an existing contract, the bidder is **not** identified on the DGS list of ineligible businesses or persons and that the bidder is **not** engaged in investment activities in Iran in violation of the Iran Contracting Act of 2010.

California law establishes penalties for providing false certifications, including civil penalties equal to the greater of \$250,000 or twice the amount of the contract for which the false certification was made; contract termination; and three-year ineligibility to bid on contracts (PCC § 2205).

To comply with the Iran Contracting Act of 2010, the bidder shall provide its vendor or financial institution name, and City Business Tax Registration Certificate (BTRC) if available, in completing ONE of the options shown below.

OPTION #1: CERTIFICATION

I, the official named below, certify that I am duly authorized to execute this certification on behalf of the bidder or financial institution identified below, and that the bidder or financial institution identified below is **not** on the current DGS list of persons engaged in investment activities in Iran and is **not** a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person or vendor, for 45 days or more, if that other person or vendor will use the credit to provide goods or services in the energy sector in Iran and is identified on the current DGS list of persons engaged in investment activities in Iran.

<i>Vendor Name/Financial Institution (printed)</i>		<i>BTRC (or n/a)</i>
<i>By (Authorized Signature)</i>		
<i>Print Name and Title of Person Signing</i>		
<i>Date Executed</i>	<i>City Approval (Signature)</i>	<i>(Print Name)</i>

OPTION #2: EXEMPTION

Pursuant to PCC § 2203(c) and (d), a public entity may permit a bidder or financial institution engaged in investment activities in Iran, on a case-by-case basis, to be eligible for, or to bid on, submit a proposal for, or enter into, or renew, a contract for goods and services. If the bidder or financial institution identified below has obtained an exemption from the certification requirement under the Iran Contracting Act of 2010, the bidder or financial institution shall complete and sign below and attach documentation demonstrating the exemption approval.

<i>Vendor Name/Financial Institution (printed)</i>		<i>BTRC (or n/a)</i>
<i>By (Authorized Signature)</i>		
<i>Print Name and Title of Person Signing</i>		
<i>Date Executed</i>	<i>City Approval (Signature)</i>	<i>(Print Name)</i>

DIVISION D
POST-BID DOCUMENTS

C O N T R A C T

THIS CONTRACT is made and entered, in duplicate, as of _____, 20__
for reference purposes only, pursuant to a minute order adopted by the City Council of the
City of Long Beach at its meeting held on _____, 20__, by and between
_____, a California corporation/partnership/limited liability
company (“Contractor”), whose address is _____,
and the CITY OF LONG BEACH, a municipal corporation (“City”).

WHEREAS, pursuant to a Notice Inviting Bids for _____ in
the City of Long Beach, California, dated _____, 20__, and published by City, bids
were received, publicly opened and declared on the date specified in said Notice; and

WHEREAS, the City Manager accepted the bid of Contractor; and

WHEREAS, the City Council authorized the City Manager to enter a contract
with Contractor for the work described in Project Plans and Specifications No. R-_____;

NOW, THEREFORE, in consideration of the mutual terms and conditions
herein, the parties agree as follows:

1. SCOPE OF WORK. Contractor shall furnish all necessary labor,
supervision, tools, materials, supplies, appliances, equipment and transportation for the
work described in Project Plans and Specifications No. R-_____ for _____
in the City of Long Beach, California, said work to be performed according to the Contract
Documents identified below. However, this Contract is intended to provide to City complete
and finished work and, to that end, Contractor shall do everything necessary to complete
the work, whether or not specifically described in the Contract Documents.

2. PRICE AND PAYMENT.

A. City shall pay to Contractor the amount(s) for materials and
work identified in Contractor’s Bid for _____ in the City of
Long Beach, California, attached hereto as Exhibit “A”; provided, however, that the
total compensation to Contractor shall not exceed the maximum cumulative amount

1 of _____ Dollars (\$_____) for the estimated quantities established
2 in the Bid, subject to additions or deductions as provided in the Contract Documents.

3 B. Contractor shall submit requests for progress payments and
4 City will make payments in due course of payments in accordance with Section 9 of
5 the Standard Specifications for Public Works Construction (latest edition) (the
6 “Greenbook”).

7 3. CONTRACT DOCUMENTS.

8 A. The Contract Documents include: The Notice Inviting Bids,
9 Project Specifications No. R-____ (which may include by reference the Standard
10 Specifications for Public Works Construction, latest edition, and any supplements
11 thereto, collectively the “Standard Specifications”); the City of Long Beach Standard
12 Plans; Project Drawing No. _____ for this work; the California Code of Regulations;
13 the various Uniform Codes applicable to trades; the prevailing wage rates;
14 Instructions to Bidders; the Bid; the bid security; the City of Long Beach
15 Disadvantaged, Minority and Women-Owned Business Enterprise Program; the
16 Citywide Project Labor Agreement; this Contract and all documents attached hereto
17 or referenced herein including but not limited to insurance; Bond for Faithful
18 Performance; Payment Bond; Notice to Proceed; Notice of Completion; any
19 addenda or change orders issued in accordance with the Standard Specifications;
20 any permits required and issued for the work; approved final design drawings and
21 documents; the Information Sheet; and the Letter of Assent (“Contract Documents”).
22 These Contract Documents are incorporated herein by the above reference and
23 form a part of this Contract.

24 B. Notwithstanding Section 2-5.2 of the Standard Specifications,
25 if any conflict or inconsistency exists or develops among or between Contract
26 Documents, the following priority shall govern: 1) Permit(s) from other public
27 agencies; 2) Change Orders; 3) this Contract (including any and all amendments
28 hereto); 4) Addenda (which shall include written clarifications, corrections and

1 changes to the bid documents and other types of written notices issued prior to bid
2 opening; 5) Project Specifications; 6) Project Plans (including drawings); 7) the City
3 of Long Beach Standard Plans; 8) Standard Specifications (as identified in Section
4 3.A. of the Greenbook); 9) other reference specifications; 10) other reference
5 plans; 11) the Bid; and 12) the Notice Inviting Bids.

6 4. TIME FOR CONTRACT. Contractor shall commence work on a date
7 to be specified in a written Notice to Proceed from City and shall complete all work within
8 _____ (___) working/calendar days thereafter, subject to strikes, lockouts and
9 events beyond the control of Contractor. Time is of the essence hereunder. City will suffer
10 damage if the work is not completed within the time stated, but those damages would be
11 difficult or impractical to determine. So, Contractor shall pay to City, as liquidated
12 damages, the amount stated in the Contract Documents.

13 5. ACCEPTANCE OF WORK NOT TO CONSTITUTE A WAIVER. The
14 acceptance of any work or the payment of any money by City shall not operate as a waiver
15 of any provision of any Contract Document, of any power reserved to City, or of any right
16 to damages or indemnity hereunder. The waiver of any breach or any default hereunder
17 shall not be deemed a waiver of any other or subsequent breach or default.

18 6. WORKERS' COMPENSATION CERTIFICATION. Concurrently
19 herewith, Contractor shall submit certification of Workers' Compensation coverage in
20 accordance with California Labor Code Sections 1860 and 3700, a copy of which is
21 attached hereto as Exhibit "B".

22 7. CLAIMS FOR EXTRA WORK. No claim shall be made at any time
23 upon City by Contractor for and on account of any extra or additional work performed or
24 materials furnished, unless such extra or additional work or materials shall have been
25 expressly required by the City Manager and the quantities and price thereof shall have
26 been first agreed upon, in writing, by the parties hereto.

27 8. CLAIMS. Contractor shall, upon completion of the work, deliver
28 possession thereof to City ready for use and free and discharged from all claims for labor

1 and materials in doing the work and shall assume and be responsible for, and shall protect,
2 defend, indemnify and hold harmless City from and against any and all claims, demands,
3 causes of action, liability, loss, costs or expenses for injuries to or death of persons, or
4 damages to property, including property of City, which arises from or is connected with the
5 performance of the work.

6 9. INSURANCE. Prior to commencement of work, and as a condition
7 precedent to the effectiveness of this Contract, Contractor shall provide to City evidence of
8 all insurance required in the Contract Documents.

9 In addition, Contractor shall complete and deliver to City the form
10 (“Information Sheet”) attached as Exhibit “C” and incorporated by reference, to comply with
11 Labor Code Section 2810.

12 10. WORK DAY. Contractor shall comply with Sections 1810 through
13 1815 of the California Labor Code regarding hours of work. Contractor shall forfeit, as a
14 penalty to City, the sum of Twenty-Five Dollars (\$25.00) for each worker employed by
15 Contractor or any subcontractor for each calendar day such worker is required or permitted
16 to work more than eight (8) hours unless that worker receives compensation in accordance
17 with Section 1815.

18 11. PREVAILING WAGE RATES. Contractor is directed to pay the
19 general rate of per diem wages for each craft, classification, or type of worker needed to
20 execute the contract (prevailing wage rates). Copies of the current prevailing rate of per
21 diem wages are on file at its principal office (Labor Compliance Division, 411 W. Ocean
22 Boulevard, 6th Floor, Long Beach, California, 90802), and shall be made available to any
23 interested party upon request. Contractor is required to post a copy of the determination of
24 the director of the prevailing rate of per diem wages at each job site. Pursuant to Section
25 1775, Contractor shall forfeit, as a penalty to the City, up to Two Hundred Dollars (\$200)
26 for each laborer, worker or mechanic employed for each calendar day, or portion thereof,
27 that such laborer, worker or mechanic is paid less than the prevailing wage rates for any
28 work done by Contractor, or any subcontractor, under this Contract. The difference

1 between the prevailing wage rates and the amount paid to each worker for each calendar
2 day or portion thereof for which each worker was paid less than the prevailing wage rate
3 shall be paid to each worker by the Contractor or subcontractor.

4 12. DEPARTMENT OF INDUSTRIAL RELATIONS COMPLIANCE.

5 Contractor is advised that this work constitutes a public work of improvement subject to
6 California Labor Code Division 2, Part 7, Chapter 1, Articles 1-5, §§1720-1861. Pursuant
7 to Labor Code Section 1771.1. Contractor or subcontractors shall not be qualified to bid
8 on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public
9 contract Code, or engage in the performance of any contract for public work, as defined in
10 the California Labor Code, unless currently registered and qualified to perform public work
11 pursuant to Section 1725.5. Contract (or associated subcontracts) shall not be entered into
12 without proof of the Contractor's (or subcontractor's) current registration to perform public
13 work pursuant to Section 1725.5. All work conducted in support of this public work of
14 improvement is subject to compliance monitoring and enforcement by the Department of
15 Industrial Relations. Contractor will abide by all applicable apprenticeship requirements in
16 the California Labor Code Section 1777.5 and will be responsible for subcontractor
17 apprenticeship compliance to the same.

18 13. CERTIFIED PAYROLL RECORDS.

19 A. Pursuant to the provisions of Labor Code Section 1776,
20 Contractor shall keep and shall cause each subcontractor performing any portion of
21 the work under this Contract to keep an accurate payroll record, showing the name,
22 address, social security number, work classification, straight time and overtime
23 hours worked each day and week, and the actual per diem wages paid to each
24 journeyman, apprentice, worker, or other employee employed by Contractor or
25 subcontractor in connection with the work. Such payroll records for Contractor and
26 all subcontractors shall be certified and shall be available for inspection at all
27 reasonable hours at the principal office of Contractor pursuant to the provisions of
28 Section 1776 of the Labor Code. Contractor's failure to furnish such records to City

1 or City's authorized Labor Compliance representative in the manner provided herein
2 for notices shall entitle City to withhold the penalty prescribed by law from progress
3 payments due to Contractor.

4 B. Contractor shall submit to the City certified payroll records for
5 Contractor and all subcontractors performing any portion of the work under this
6 Contract on a monthly basis. Certified payroll records for Contractor and all
7 subcontractors shall be maintained during the course of the work and shall be kept
8 by Contractor for at least three (3) years after completion of the work.

9 C. The foregoing is in addition to, and not in lieu of, any other
10 requirements or obligations established and imposed by any department of the City
11 with regard to submission and retention of certified payroll records for Contractor
12 and subcontractors.

13 14. COORDINATION WITH GOVERNMENTAL REGULATIONS.

14 A. If the work is terminated pursuant to an order of any Federal or
15 State authority, Contractor shall accept as full and complete compensation under
16 this Contract such amount of money as will equal the product of multiplying the
17 Contract price stated herein by the percentage of work completed by Contractor as
18 of the date of such termination, and for which Contractor has not been paid. If the
19 work is so terminated, the City Engineer, after consultation with Contractor, shall
20 determine the percentage of work completed and the determination of the City
21 Engineer shall be final.

22 B. If Contractor is prevented, in any manner, from strict
23 compliance with the Plans and Specifications due to any Federal or State law, rule
24 or regulation, in addition to all other rights and remedies reserved to the parties City
25 may by resolution of the City Council suspend performance hereunder until the
26 cause of disability is removed, extend the time for performance, make changes in
27 the character of the work or materials, or terminate this Contract without liability to
28 either party.

1 15. NOTICES.

2 A. Any notice required hereunder shall be in writing and personally
3 delivered or deposited in the U.S. Postal Service, first class, postage prepaid, to
4 Contractor at the address first stated herein, and to the City at 411 West Ocean
5 Boulevard, Long Beach, California 90802, Attn: City Manager. Notice of change of
6 address shall be given in the same manner as stated herein for other notices. Notice
7 shall be deemed given on the date deposited in the mail or on the date personal
8 delivery is made, whichever first occurs.

9 B. Except for stop notices and claims made under the Labor Code,
10 City will notify Contractor when City receives any third party claims relating to this
11 Contract in accordance with Section 9201 of the Public Contract Code.

12 16. BONDS. Contractor shall, simultaneously with the execution of this
13 Contract, execute and deliver to City a good and sufficient corporate surety bond, in the
14 form attached hereto and in the amount specified therein, conditioned upon the faithful
15 performance of this Contract by Contractor, and a good and sufficient corporate surety
16 bond, in the form attached hereto and in the amount specified therein, conditioned upon
17 the payment of all labor and material claims incurred in connection with this Contract.

18 17. COVENANT AGAINST ASSIGNMENT. Neither this Contract nor any
19 of the moneys that may become due Contractor hereunder may be assigned by Contractor
20 without the written consent of City first had and obtained, nor will City recognize any
21 subcontractor as such, and all persons engaged in the work of construction will be
22 considered as independent contractors or agents of Contractor and will be held directly
23 responsible to Contractor.

24 18. RESPONSIBILITY OF CONTRACTOR. Notwithstanding anything to
25 the contrary in the Standard Specifications, Contractor shall have the responsibility, care
26 and custody of the work. If any loss or damage occurs to the work that is not covered by
27 collectible commercial insurance, excluding loss or damage caused by earthquake or flood
28 or the negligence or willful misconduct of City, then Contractor shall immediately make the

1 City whole for any such loss or pay for any damage. If Contractor fails or refuses to make
2 the City whole or pay, then City may do so and the cost and expense of doing so shall be
3 deducted from the amount due Contractor from City hereunder.

4 19. CONTINUATION. Termination or expiration of this Contract shall not
5 terminate the rights or liabilities of either party which rights or liabilities accrued or existed
6 prior to termination or expiration of this Contract.

7 20. TAXES AND TAX REPORTING.

8 A. As required by federal and state law, City is obligated to and
9 will report the payment of compensation to Contractor on Form 1099-Misc.
10 Contractor shall be solely responsible for payment of all federal and state taxes
11 resulting from payments under this Contract. Contractor shall submit Contractor's
12 Employer Identification Number (EIN), or Contractor's Social Security Number if
13 Contractor does not have an EIN, in writing to City's Accounts Payable, Department
14 of Financial Management. Contractor acknowledges and agrees that City has no
15 obligation to pay Contractor until Contractor provides one of these numbers.

16 B. Contractor shall cooperate with City in all matters relating to
17 taxation and the collection of taxes, particularly with respect to the self-accrual of
18 use tax. Contractor shall cooperate as follows: (i) for all leases and purchases of
19 materials, equipment, supplies, or other tangible personal property totaling over One
20 Hundred Thousand Dollars (\$100,000.00) shipped from outside California, a
21 qualified Contractor shall complete and submit to the appropriate governmental
22 entity the form in Appendix "A" attached hereto; and (ii) for construction contracts
23 and subcontracts totaling Five Million Dollars (\$5,000,000.00) or more, Contractor
24 shall obtain a sub-permit from the California Department of Tax and Fee
25 Administration ("CFTA") for the Work site. "Qualified" means that the Contractor
26 purchased at least Five Hundred Thousand Dollars (\$500,000.00) in tangible
27 personal property that was subject to sales or use tax in the previous calendar year.

28 C. Contractor shall create and operate a buying company, as

1 defined in CFTA Regulation 1699, subpart (i), in City if Contractor will purchase over
2 Five Million Dollars (\$5,000,000.00) in tangible personal property subject to
3 California sales and use tax.

4 D. In completing the form and obtaining the permit(s), Contractor
5 shall use the address of the Work site as its business address and may use any
6 address for its mailing address. Copies of the form and permit(s) shall also be
7 delivered to the City Engineer. The form must be submitted and the permit(s)
8 obtained as soon as Contractor receives a Notice to Proceed. Contractor shall not
9 order any materials or equipment over One Hundred Thousand Dollars
10 (\$100,000.00) from vendors outside California until the form is submitted and the
11 permit(s) obtained and, if Contractor does so, it shall be a material breach of this
12 Contract. In addition, Contractor shall make all purchases from the Long Beach
13 sales office of its vendors if those vendors have a Long Beach office and all
14 purchases made by Contractor under this Contract which are subject to use tax of
15 Five Hundred Thousand Dollars (\$500,000.00) or more shall be allocated to the City
16 of Long Beach. Contractor shall require the same cooperation with City, with
17 regards to subsections B, C and D under this section (including forms and permits),
18 from its subcontractors and any other subcontractors who work directly or indirectly
19 under the overall authority of this Contract.

20 E. Contractor shall not be entitled to and by signing this Contract
21 waives any claim or damages for delay against City if Contractor does not timely
22 submit these forms to the appropriate governmental entity. Contractor may request
23 a waiver to subsections B, C, and/or D. Waiver requests must be submitted in writing
24 and will be subject to City review and approval. Contractor may contact the Financial
25 Management Department, Budget Management Bureau at (562) 570-6425 for
26 assistance with the form.

27 21. ADVERTISING. Contractor shall not use the name of City, its officials
28 or employees in any advertising or solicitation for business, nor as a reference, without the

1 prior approval of the City Manager, City Engineer or designee.

2 22. AUDIT. City shall have the right at all reasonable times during
3 performance of the work under this Contract for a period of five (5) years after final
4 completion of the work to examine, audit, inspect, review, extract information from and
5 copy all books, records, accounts and other documents of Contractor relating to this
6 Contract.

7 23. NO PECULIAR RISK. Contractor acknowledges and agrees that the
8 work to be performed hereunder does not constitute a peculiar risk of bodily harm and that
9 no special precautions are required to perform said work.

10 24. THIRD PARTY BENEFICIARY. This Contract is intended by the
11 parties to benefit themselves only and is not in any way intended or designed to or entered
12 for the purpose of creating any benefit or right of any kind for any person or entity that is
13 not a party to this Contract.

14 25. SUBCONTRACTORS. Contractor agrees to and shall bind every
15 subcontractor to the terms of this Contract; provided, however, that nothing herein shall
16 create any obligation on the part of City to pay any subcontractor except in accordance
17 with a court order in an action to foreclose a stop notice. Failure of Contractor to comply
18 with this Section shall be deemed a material breach of this Contract. A list of
19 subcontractor(s) submitted by Contractor in compliance with Public Contract Code
20 Sections 4100 et seq. is attached hereto as Exhibit "D" and incorporated herein by this
21 reference.

22 26. NO DUTY TO INSPECT. No language in this Contract shall create
23 and City shall not have any duty to inspect, correct, warn of or investigate any condition
24 arising from Contractor's work hereunder, or to insure compliance with laws, rules or
25 regulations relating to said work. If City does inspect or investigate, the results thereof
26 shall not be deemed compliance with or a waiver of any requirements of the Contract
27 Documents.

28 27. GOVERNING LAW. This Contract shall be governed by and

1 construed pursuant to the laws of the State of California (except those provisions of
2 California law pertaining to conflicts of laws).

3 28. INTEGRATION. This Contract, including the Contract Documents
4 identified in Section 3 hereof, constitutes the entire understanding between the parties and
5 supersedes all other agreements, oral or written, with respect to the subject matter herein.

6 29. NONDISCRIMINATION. In connection with performance of this
7 Contract and subject to federal laws, rules and regulations, Contractor shall not
8 discriminate in employment or in the performance of this Contract on the basis of race,
9 religion, national origin, color, age, sex, sexual orientation, gender identity, AIDS, HIV
10 status, handicap or disability. It is the policy of the City to encourage the participation of
11 Disadvantaged, Minority and Women-Owned Business Enterprises, and the City
12 encourages Contractor to use its best efforts to carry out this policy in the award of all
13 subcontracts.

14 30. EQUAL BENEFITS ORDINANCE. Unless otherwise exempted in
15 accordance with the provisions of the Ordinance, this Contract is subject to the applicable
16 provisions of the Equal Benefits Ordinance (“EBO”), section 2.73 et seq. of the Long Beach
17 Municipal Code, as amended from time to time.

18 A. During the performance of this Contract, the Contractor certifies
19 and represents that the Contractor will comply with the EBO. The Contractor agrees
20 to post the following statement in conspicuous places at its place of business
21 available to employees and applicants for employment:

22 “During the performance of a Contract with the City of Long Beach, the
23 Contractor will provide equal benefits to employees with spouses and its
24 employees with domestic partners. Additional information about the City of
25 Long Beach’s Equal Benefits Ordinance may be obtained from the City of
26 Long Beach Business Services Division at 562-570-6200.”

27 B. The failure of the Contractor to comply with the EBO will be
28 deemed to be a material breach of the Contract by the City.

1 C. If the Contractor fails to comply with the EBO, the City may
2 cancel, terminate or suspend the Contract, in whole or in part, and monies due or to
3 become due under the Contract may be retained by the City. The City may also
4 pursue any and all other remedies at law or in equity for any breach.

5 D. Failure to comply with the EBO may be used as evidence
6 against the Contractor in actions taken pursuant to the provisions of Long Beach
7 Municipal Code 2.93 et seq., Contractor Responsibility.

8 E. If the City determines that the Contractor has set up or used its
9 contracting entity for the purpose of evading the intent of the EBO, the City may
10 terminate the Contract on behalf of the City. Violation of this provision may be used
11 as evidence against the Contractor in actions taken pursuant to the provisions of
12 Long Beach Municipal Code section 2.93 et seq., Contractor Responsibility.

13 31. PROJECT LABOR AGREEMENT. This Project is covered by a
14 Citywide Project Labor Agreement (“PLA”) entered into by the City of Long Beach with the
15 Los Angeles/Orange Counties Building and Construction Trades Council and the signatory
16 Craft Unions. The PLA contains a local hiring goal of 40%, calculated based on total hours
17 worked. The local hire provision requires best efforts to utilize qualified workers residing
18 in first tier zip codes (which include all of the City of Long Beach), then in second tier zip
19 codes (which reflect the Gateway Cities), and finally in Los Angeles and Orange Counties.
20 However, if Project work is funded in full or in part by State of California Tideland funds,
21 then the local hire provision requires best efforts to utilize qualified workers residing within
22 the Counties of Los Angeles or Orange. In addition, there is a provision with a goal of ten
23 percent (10%) to hire Transitional Workers and Veterans. Contractor shall complete and
24 deliver to City the form (“Letter of Assent”) attached hereto as Exhibit “E” and incorporated
25 by reference, to comply with the PLA. Contractor agrees to work with the City and its
26 selected Independent Jobs Coordinator, if applicable, to promote the local hiring goals and
27 objectives of the PLA.

28 32. ADDITIONAL STATE REQUIREMENTS.

1 A. The Department of Parks and Recreation, Division of Boating
2 and Waterways and its agents may, at any and all reasonable times during the term
3 of this Agreement, enter the Project Area for purposes of inspecting the Project
4 Area. The Project Area shall be as depicted in Exhibit "F".

5 B. Contractor and its subcontractors shall not unlawfully
6 discriminate, harass, or allow harassment against any employee who is employed
7 in the work covered by this Agreement or against any applicant for such employment
8 because of sex, sexual orientation, race, color, ancestry, religious creed, national
9 origin, physical disability (including HIV and AIDS), mental disability, medical
10 condition (cancer), age, marital status, and denial of family car leave, and that such
11 provisions shall include, but not be limited to: employment, upgrading, promotion or
12 transfer, recruitment, or recruitment advertising, layoff or termination, rates of pay
13 or other forms of compensation, and selection for training including apprenticeship.

14 C. Contractor shall comply with all air pollution and environmental
15 control rules, regulations, ordinances and statues which apply to any work
16 performed pursuant to this Agreement.

17 D. Contractor shall perform any work under this Agreement in
18 accordance with plans and specifications, and quality control shall be performed,
19 and compliance with specifications shall be verified by qualified professionals
20 approved by the City or its designee.

21 E. Contractor shall prepare a concrete test panel. No placement
22 or v-grooving of concrete for boat launching ramps on the Project shall be allowed
23 until the Contractor demonstrates proficiency in creating a satisfactory v-grooved
24 surface by preparing a concrete test panel measuring no less than 6 feet by 4 feet.
25 A Department of Parks and Recreation, Division of Boating and Waterways
26 representative must accept the test panel before the Contractor shall be allowed to
27 place or v-groove concrete for boat launching ramps. Precast boat launching ramp
28 panels are exempt from the test panel requirements but must also be approved by

1 a Department of Parks and Recreation, Division of Boating and Waterways
2 representative prior to placement or installation. Test panels must be adjacent to,
3 but not part of, any ramp work to be completed and must remain accessible until all
4 ramp works is complete and accepted by the Department of Parks and Recreation,
5 Division of Boating and Waterways. Contractor may incorporate test panel into
6 other concrete work (i.e., trash enclosure, etc.).

7 F. Contractor agrees to waive all claims against the Department
8 of Parks and Recreation, Division of Boating and Waterways, including the right to
9 contribution for any losses or damages arising from, growing out of, or in any way
10 connected with or incident to this Agreement.

11 G. The Contractor agrees to indemnify, defend and hold
12 harmless, the Department of Parks and Recreation, Division of Boating and
13 Waterways, its officers, agents and employees from any and all claims and losses
14 accruing or resulting to any and all contractors, subcontractors, suppliers, laborers,
15 and any other person, firm entity or corporation furnishing or supplying work
16 services, materials, or supplies in connection with the performance of this
17 Agreement, and/or from any and all claims and losses accruing or resulting to any
18 person, firm, entity or corporation who may be injured or damaged by Contractor in
19 the performance of this Agreement.

20 H. If the Department of Parks and Recreation, Division of Boating
21 and Waterways is named as a co-defendant, the Contractor shall notify the
22 Department of Parks and Recreation, Division of Boating and Waterways and
23 represent it unless the Department of Parks and Recreation, Division of Boating and
24 Waterways elects to represent itself. If the Department of Parks and Recreation,
25 Division of Boating undertakes its own defense, it shall bear its own litigation costs,
26 expenses and attorney's fees.

27 33. DEFAULT. Default shall include but not be limited to Contractor's
28 failure to perform in accordance with the Plans and Specifications, failure to comply with

OFFICE OF THE CITY ATTORNEY
DAWN MCINTOSH, City Attorney
411 West Ocean Boulevard, 9th Floor
Long Beach, CA 90802-4664

1 any Contract Document, failure to pay any penalties, fines or charges assessed against
2 Contractor by any public agency, failure to pay any charges or fees for services performed
3 by the City, and if Contractor has substituted any security in lieu of retention, then default
4 shall also include City's receipt of a stop notice. If default occurs and Contractor has
5 substituted any security in lieu of retention, then in addition to City's other legal remedies,
6 City shall have the right to draw on the security in accordance with Public Contract Code
7 Section 22300 and without further notice to Contractor. If default occurs and Contractor
8 has not substituted any security in lieu of retention, then City shall have all legal remedies
9 available to it.

10 IN WITNESS WHEREOF, the parties have caused this document to be duly
11 executed with all formalities required by law as of the date first stated above.

12 _____, 20__ (company), a corporation
13 By _____
14 Name _____
15 Title _____

16 _____, 20__ By _____
17 Name _____
18 Title _____

19 "Contractor"
20 CITY OF LONG BEACH, a municipal
21 _____, 20__ By _____
22 City Manager

23 "City"
24 This Contract is approved as to form on _____, 20__.

25 DAWN MCINTOSH, City Attorney
26 By _____
27 Deputy
28

**PERFORMANCE BOND
(Bond for Faithful Performance)**

WHEREAS, The CITY OF LONG BEACH, a municipal corporation of the State of California, hereinafter the "City" or "Obligee," have conditionally awarded to _____ designated as the "Contractor" or "Principal" herein, a contract for the work ("Work") described as follows:

_____, as described in Specification No.: _____, Addenda/Addendum No. _____ and related drawings.

WHEREAS, the Principal is about to enter into a Contract with Obligee for performance of the Work, which Contract, and all Contract Documents set forth therein are incorporated herein by this reference.

WHEREAS, the Principal is required to furnish a bond guaranteeing the prompt, full and faithful performance of its obligations under the Contract Documents concurrently with delivery to Obligee of the executed Contract.

NOW, THEREFORE, we the undersigned Contractor, as Principal, and _____, an admitted surety insurer in the State of California, as Surety, are held and firmly bound unto THE CITY OF LONG BEACH, a municipal corporation of the State of California (hereinafter the "City" or "Obligee") in the penal sum of _____ Dollars (\$ _____) lawful money of the United States, for the payment of which sum, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

If the Principal shall promptly, fully and faithfully perform each and all of the obligations and things to be done and performed by the Principal in strict accordance with the terms of the Contract Documents as said Contract Documents may be modified or amended from time to time; and if the Principal shall indemnify and save harmless the Obligee and all of its officers, agents and employees from any and all losses, liability and damages, claims, judgments, stop notices, costs, and fees of every description, whether imposed by law or equity, which may be incurred by the Obligee by reason of the failure or default on the part of the Principal in the performance of any or all of the terms or the obligations of the Contract Documents, as they may be amended and supplemented including, but not limited to, its liability for liquidated damages for delay, all warranties or guarantees required thereunder and indemnity obligations; then this obligation shall be void; otherwise, it shall be, and remain, in full force and effect.

Whenever the Principal shall be, and is declared by the Obligee to be in default under the Contract, which shall include without limitation, any breach or default of the Contract Documents, then, after written notice from the Obligee to the Surety, as provided for below, the Surety shall either remedy the default or breach by the Principal or shall promptly and faithfully take charge of the Work of and complete the Work in accordance with the requirements of the Contract Documents with a contractor other than the Principal at its own expense and make available as work progresses sufficient funds to pay the cost of completion less the balance of the Contract price including other costs and damages for which the surety may be liable hereunder; provided, however, that the procedure by which the Surety undertakes to discharge its obligations under this Bond shall be subject to the advance written approval of the Obligee.

Within fifteen (15) days of Obligee's written notice to the Surety of the failure of performance of the Contract by the Principal, it shall be the duty of the Surety to give to the Obligee an unequivocal notice in writing of the Surety's election to remedy the default(s) of the Principal promptly, or to arrange for performance of the Contract promptly by a Contractor other than the Principal, time being of essence to this Bond. In said Notice of Election, the Surety shall state the date of commencement of its cure or remedy of the Principal's default(s) or its performance of the Contract. The Surety's obligations for cure or remedy, include but are not limited to: correction of defective work and completion of the Contract, additional legal, design professional and delay costs arising from Surety's actions or failure to act; and liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance by the Principal. The Surety shall give prompt written notice to the Obligee upon completion of the cure or remedy of the Principal's default(s) of its performance of the Construction Contract.

If the Surety does issue its Notice of Election and does not proceed to cure or remedy the Principal's default(s) of its performance of the Work with reasonable promptness, the Surety shall be deemed to be in default on this bond fifteen (15) days after receipt of a written notice from Obligee to the Surety demanding that the Surety perform its obligations under this Bond, and the Obligee shall be entitled to enforce any remedy available to Obligee.

The Surety and Principal, for value received, hereby stipulate and agree that no change, extension of time, modification, alteration or addition to the terms of the Contract or Contract Documents or to the Work to be performed thereunder shall in any way affect or release the Principal or Surety or their respective heirs, executors, administrators, successors and assigns from their obligations on this bond, and Surety does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or Contract Documents, or to the Work. No premature payment by the City to the Principal shall release or exonerate the Surety, unless the Officer or Board of the City ordering the payment shall have actual notice at the time the order is made that the payment is in fact premature, and then only to the extent that such payment shall result in actual loss to the Surety, but in no event more than the amount of such premature payment.

FURTHER, Principal and Surety agree that if Obligee is required to engage the services of attorneys in connection with enforcement of the bond, each shall pay Obligee's reasonable attorneys' fees incurred, with or without suit, in addition to the above penal sum.

The guarantees contained herein shall survive the final completion of the Work called for in the Contract Documents with respect to the obligations and liabilities of the Principal which survive such final completion.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above-named, on the _____ day of _____, 20__.

<p style="text-align: center;">_____ Surety Name</p> <p>By: _____ Signature</p> <p>Name: _____ Printed Name</p> <p>Title: _____</p> <p>Address: _____</p> <p>Telephone: _____</p> <p>_____ Attorney-in-Fact</p> <p>_____ Signature</p>	<p style="text-align: center;">_____ Principal Name</p> <p>By: _____ Signature</p> <p>Name: _____ Printed Name</p> <p>Title: _____</p> <p>By: _____ Signature</p> <p>Name: _____ Printed Name</p> <p>Title: _____</p>
--	---

(Attach Attorney-in-Fact Certificate, Corporate Seal and Surety Seal)

<p>_____, 20__</p> <p>Approved as to form.</p> <p>CHARLES PARKIN, City Attorney</p> <p>By: _____ Deputy City Attorney</p>	<p>_____, 20__</p> <p>Approved as to sufficiency.</p> <p>CITY OF LONG BEACH, a municipal corporation</p> <p>By: _____ City Manager/City Engineer</p>
---	--

NOTE:

1. Execution of this bond must be acknowledged by both PRINCIPAL and SURETY before a Notary Public and Notary's certificate of each acknowledgment must be attached.
2. A corporation must execute this bond by duly authorized officers or agents, and a certified copy of a resolution of its Board of Directors authorizing such execution, or other evidence of authority for such execution, must be attached if executed by persons other than the officers listed in Section 313, California Corporations Code.

Payment Bond
No. _____

**PAYMENT BOND
(Labor and Material Bond)**

WHEREAS, The CITY OF LONG BEACH, a municipal corporation, hereinafter the "City" or "Obligee," have conditionally awarded to _____ designated as the "Contractor" or "Principal" herein, a contract for the work ("Work") described as follows:

_____, as described in Specification No.: _____, Addenda/Addendum No. _____ and related drawings.

WHEREAS, the Principal is about to enter into a Contract with the Obligee for the performance of the Work, which Contract and all Contract Documents set forth therein are incorporated herein by this reference.

WHEREAS, by the terms of said Contract Documents, as well as Civil Code Sections 9550 and 9554, Principal is required to furnish a bond for the prompt, full and faithful payment to any Claimant, as hereinafter defined, for all labor, materials or services used or reasonably required for use in the performance of the Work of the Project;

NOW THEREFORE, we the undersigned Contractor, as Principal, and _____ admitted as a surety insurer in the State of California ("Surety"), are held and firmly bound to the City for payment of the penal sum of _____ Dollars (\$_____) lawful money of the United States, for which payment we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, shall fail to pay any of the persons named in Civil Code Section 9100 ("Claimants"), for all labor, materials or services used or reasonably required for use in performance of the Work of the Project, or for any amounts due under the Unemployment Insurance Code with respect to work or labor performed by any such Claimant on the Project, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work and labor, that the surety or sureties herein will pay for the same in an amount not exceeding the sum specified in this bond, otherwise the above obligation shall be void.

If suit is brought upon this bond, the said Surety will pay reasonable attorney's fees to be fixed by the court.

This bond shall inure to the benefit of any of the persons named in Civil Code Section 9100 so as to give a right of action to such persons or the assigns in any suit brought upon this bond.

The Surety and Principal, for value received, hereby stipulate and agree that no change, extension of time, modification, alteration or addition to the terms of the Contract or Contract Documents or to the Work to be performed thereunder shall in any way affect or release the Principal or Surety or their respective heirs, executors, administrators, successors and assigns from their obligations on this bond, and Surety does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or Contract Documents, or to the Work. No premature payment by the City to the Principal shall release or exonerate the Surety, unless the Officer or Board of the City ordering the payment shall have actual notice at the time the order is made that the payment is in fact premature, and then only to the extent that such payment shall result in actual loss to the Surety, but in no event more than the amount of such premature payment.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above-named, on the _____ day of _____, 20____.

Surety Name
By: _____
Signature
Name: _____
Printed Name
Title: _____
Address: _____
Telephone: _____

Principal Name
By: _____
Signature
Name: _____
Printed Name
Title: _____
By: _____
Signature
Name: _____
Printed Name
Title: _____

Attorney-in-Fact

Signature

(Attach Attorney-in-Fact Certificate, Corporate Seal and Surety Seal)

_____, 20__

_____, 20__

Approved as to form.

Approved as to sufficiency.

CHARLES PARKIN, City Attorney

CITY OF LONG BEACH, a municipal corporation

By: _____
Deputy City Attorney

By: _____
City Manager/City Engineer

NOTE:

1. Execution of this bond must be acknowledged by both PRINCIPAL and SURETY before a Notary Public and Notary's certificate of each acknowledgment must be attached.

2. A corporation must execute this bond by duly authorized officers or agents, and a certified copy of a resolution of its Board of Directors authorizing such execution, or other evidence of authority for such execution, must be attached if executed by persons other than the officers listed in Section 313, California Corporations Code.

Return completed certificates to:
 City of Long Beach, 10th floor
 411 W. Ocean Boulevard, Risk Mgmt.
 Long Beach, California 90802

CERTIFICATE OF INSURANCE
CITY OF LONG BEACH, CA
("the City")
A Municipal Corporation

Only this Certificate
 of Insurance Form
 will be Accepted

This certifies to the City that the following described policies have been issued to the Insured named below and are in force at this time.

Insured: .
Address:
Description of project:

Approved as to Sufficiency: _____
 City Engineer
 Approved as to Form: _____, 20____
 J. CHARLES PARKIN, City Attorney
 by _____ Deputy City Attorney

POLICIES AND INSURERS	LIMITS	POLICY NUMBER	EXPIRATION DATE
<p>Workers' Compensation and Employer's Liability</p> <p>_____</p> <p>(Name of Insurer)</p>	<p>Statutory workers comp _____</p> <p>Employer's liability* \$ _____</p> <p>* Minimum \$1,000,000 per accident</p>		
<p>General Liability*</p> <p><u>Policy form equivalent to:</u></p> <p>CG 00 01 ____</p> <p>CG 00 02 ____</p> <p>GL 00 02 ____</p> <p>_____</p> <p>(Name of Insurer)</p>	<p>\$ _____ per occurrence</p> <p>or</p> <p>\$ _____ per claim</p> <p>\$ _____ general aggregate</p> <p>* Minimum \$1,000,000 combined single limit per occurrence and \$2,000,000 General Aggregate</p>		
<p>Commercial Auto Liability*</p> <p>Symbol _____</p> <p>_____</p> <p>(Name of Insurer)</p>	<p>\$ _____ BI per accident</p> <p>\$ _____ PD per accident</p> <p>\$ _____ BI per person</p> <p>or</p> <p>\$ _____ combined single limit each accident</p> <p>* Minimum \$1,000,000 combined single limit per occurrence</p>		
<p>Excess/Umbrella Liability</p> <p>Claims-made ____</p> <p>Occurrence ____</p> <p>Umbrella ____ Excess ____</p> <p>_____</p> <p>(Name of Insurer)</p>	<p>\$ _____ per occurrence</p> <p>or</p> <p>\$ _____ per claim</p> <p>\$ _____ general aggregate</p> <p>Self-insured retention \$ _____</p>		

The following coverages or conditions are in effect:	YES	NO
The City, its officials, and employees are named on all liability policies described above as insureds as respects: (a) activities performed for the City by or on behalf of the Named Insured, (b) products and completed operation of the Named Insured, and (c) premises owned, leased, or used by the Named Insured.		
Products and Completed Operations		
The undersigned will mail to the City 30 days' written notice of cancellation or reduction of coverage or limits.		
Cross Liability Clause (or equivalent wording)		
Personal Injury, Perils A, B, and C		
Broad Form Property Damage		
X, C, and U Hazards included		
Contractual Liability Coverage applying to this contract		
Liquor Liability		
Coverage afforded the City, its officials, employees, and agents as Insureds applies as primary and not excess or contributing to any insurance issued in the name of the City.		
Waiver of subrogation from Workers' Compensation insurer.		

This certificate is issued as a matter of information. This certificate is not an insurance policy and does not amend, extend, or alter the coverage afforded the policies listed herein. Notwithstanding any requirement, term, or condition of any contract or other document with respect to which this certificate of insurance may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions, and conditions of such policies.

Agent or Brokerage _____ Insurance Company _____

Address _____ Home Office _____

Name of Person to be Contacted _____ Authorized Signature _____ Date _____

() _____ -
Telephone Number

Note: Authorized signatures may be the agent's if agent has placed insurance through an agency agreement with the insurer. If insurance is brokered, authorized signature must be that of official of insurer.



**GENERAL LIABILITY ENDORSEMENT
CITY OF LONG BEACH
411 WEST OCEAN BLVD., LONG BEACH, CA 90802**

A. POLICY INFORMATION

1. Insurance Company _____; Policy Number _____
2. Policy Term (from) _____ (to) _____; Endorsement Effective Date _____
3. Named Insured _____
4. Address _____ of _____ Named _____ Insured _____
5. Limit of Liability* Any One Occurrence/Aggregate \$
* Minimum \$1,000,000 combined single limit per occurrence with \$2,000,000 General Aggregate
6. Deductible or Self-Insured Retention (Nil unless otherwise specified): \$ _____
7. Coverage is equivalent to:
Comprehensive General Liability Form GL 00 02 (Ed. 1/73) _____
Commercial General Liability "occurrence" form CG 00 01 _____
Commercial General Liability "claims-made" form CG 00 02 _____
8. If this policy is "claims-made," the retroactive date is _____.

Note: The City's standard insurance requirements specify "occurrence" coverage. "Claims-made" coverage requires special approval.

B. POLICY AMENDMENTS

This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

1. **INSURED.** The City, its elected or appointed officials, employees, and agents are included as insureds with regard to damages and defense of claims arising from (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased, or used by the Named Insured.
2. **CONTRIBUTION NOT REQUIRED.** As respects: (a) work performed by the Named Insured for or on behalf of the City; or (b) products sold by the Named Insured to the City; or (c) premises leased by the Named Insure from the City, the insurance afforded by this policy shall be primary insurance as respects the City, its elected or appointed officials, employees, or agents; or stand in an unbroken chain of coverage excess of the Named Insured's schedule underlying primary coverage. In either event, any other insurance maintained by the City, its elected or appointed officials, employees or agents shall be in excess of this insurance and shall not contribute to it.
3. **SCOPE OF COVERAGE.** This policy, if primary, affords coverage at least as broad as:
 - (1) Insurance Services Office form number GL 00 02 (Ed.1/73), Comprehensive General Liability Insurance and Insurance Services Office form number GL 04 04 Broad Form Comprehensive General Liability endorsement; or

- (2) Insurance Services Office Commercial General Liability Coverage, "occurrence" form CG 00 01 11 85 or 11 88 or "claims-made" form CG 00 02; or
- (3) If excess, affords coverage which is at least as broad as the primary insurance forms referenced in the preceding sections (1) and (2).

4. SEVERABILITY OF INTEREST. The insurance afforded by this policy applies separately to each insured which is seeking coverage or against whom a claim is made or a suit is brought, except with respects to the Company's limit of liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the City, its elected or appointed officials, employees, or agents.

6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be cancelled, nonrenewed, reduced in coverage, or materially changed in coverage or limits except after thirty (30) days' prior written notice by certified mail return receipt requested has been given to the City. Such notice shall be addressed as shown in the heading of this statement.

C. INCIDENT AND CLAIM REPORTING PROCEDURE

Incidents and claims are to be reported to the insurer at:

Attn:

Name and title

Department

Company

Address

City

State

Zip Code

() -
Telephone number

() -
Fax number

D. SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER

I, _____(print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

SIGNATURE OF AUTHORIZED REPRESENTATIVE (original signature required on endorsement furnished to the City)

TITLE: _____ DATE: _____

ADDRESS: _____

PHONE NUMBER: _____ FAX NUMBER: _____



**AUTO LIABILITY ENDORSEMENT
CITY OF LONG BEACH
411 WEST OCEAN BLVD., LONG BEACH, CA 90802**

A. POLICY INFORMATION

1. Insurance Company _____; Policy Number _____
2. Policy Term (from) _____ (to) _____; Endorsement Effective Date _____
3. Named Insured _____
4. Address of Named Insured _____
5. Limit of Liability* Any One Occurrence/Aggregate \$ _____
* Minimum \$1,000,000 combined single limit per occurrence
6. Deductible of Self-Insured Retention (Nil unless otherwise specified): \$ _____

B. POLICY AMENDMENTS

This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

1. **INSURED.** The City, its elected or appointed officials, employees, and agents are included as insureds with regard to damages and defense of claims arising from the ownership, operation, maintenance, use, loading or unloading of any auto owned, leased, hired, or borrowed by the Named Insured, regardless of whether liability is attributable to the Named Insured or a combination of the Named Insured and the City, its elected or appointed officials, employees, and agents.
2. **CONTRIBUTION NOT REQUIRED.** As respects work performed by the Named Insured for or on behalf of the City, the insurance afforded by this policy shall: (a) be primary insurance as respects the City, its elected or appointed officials, employees, or agents; or (b) stand in an unbroken chain of coverage excess of the Named Insured's primary coverage. In either event, any other insurance maintained by the City, its elected or appointed officials, employees, or agents shall be in excess of this insurance and shall not contribute to it.
3. **SCOPE OF COVERAGE.** This policy, if primary, affords coverage at least as broad as:
 - (1) Insurance Services Office form number CA 00 01 06 92, Code 1 ("Any Auto") and endorsement CA 00 25.
 - (2) If excess, affords coverage which is at least as broad as the primary insurance forms referenced in the preceding section (1).
4. **SEVERABILITY OF INTEREST.** The insurance afforded by this policy applies separately to each insured which is seeking coverage or against whom a claim is made or a suit is brought, except with respects to the Company's limit of liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the City, its elected or appointed officials, employees, or agents.
6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be cancelled, nonrenewed, reduced in coverage, or materially changed in coverage or limits except after thirty (30) days' prior written notice by certified mail return receipt requested has been given to the City. Such notice shall be addressed as shown in the heading of this statement.

C. INCIDENT AND CLAIM REPORTING PROCEDURE

Attn:

Name and title

Department

Company

Address

City

State

Zip Code

() -
Telephone number

() -
Fax number

D. SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER

I, _____(print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

SIGNATURE OF AUTHORIZED REPRESENTATIVE (original signature required on endorsement furnished to the City)

TITLE: _____ DATE: _____

ADDRESS: _____

PHONE NUMBER: _____ FAX NUMBER: _____



**WORKER'S COMPENSATION/EMPLOYERS LIABILITY ENDORSEMENT
CITY OF LONG BEACH
411 WEST OCEAN BLVD., LONG BEACH, CA 90802**

A. POLICY INFORMATION

1. Insurance Company _____ ("the Company");
Policy Number _____
2. Effective date of this Endorsement _____ Expiration Date _____
3. Named Insured _____
4. Employer's Liability Limit*(Coverage B) \$ _____
* Minimum \$1,000,000 per accident

B. POLICY AMENDMENTS

This endorsement is issued in consideration of the policy premium and notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

1. CANCELLATION NOTICE. The insurance afforded by this policy shall not be cancelled, nonrenewed, reduced in coverage, or materially changed in coverage or limits except after thirty (30) days' prior written notice by certified mail return receipt requested has been given to the City. Such notice shall be addressed as shown in the heading of this endorsement.
2. WAIVER OF SUBROGATION. The Insurance Company agrees to waive all rights of subrogation against the City, its elected or appointed officials, agents, and employees for losses paid under the terms of this policy which arise from work performed by the Named Insured for the City.

C. SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER

I, _____ (print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

SIGNATURE OF AUTHORIZED REPRESENTATIVE (original signature required on endorsement furnished to the City)

TITLE: _____ DATE: _____

ADDRESS: _____

TELEPHONE: _____ FAX NUMBER: _____



**EXCESS LIABILITY ENDORSEMENT
CITY OF LONG BEACH
411 WEST OCEAN BLVD., LONG BEACH, CA 90802**

A. POLICY INFORMATION

1. Insurance Company _____; Policy Number _____
2. Policy Term (from) _____ (to) _____; Endorsement Effective Date _____
3. Named Insured _____
4. Address of Named Insured _____
5. Limit of Liability Any One Occurrence/Aggregate \$ _____
6. Deductible of Self-Insured Retention (Nil unless otherwise specified): \$ _____
7. Bodily Injury and Property Damage Coverage is:
_____ "claims-made"
_____ "occurrence"
If claims-made, the retroactive date is _____.

Note: The City's standard insurance requirements specify "occurrence" coverage. "Claims-made" coverage requires special approval.

B. POLICY AMENDMENTS

This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto, it is agreed as follows:

1. **INSURED.** The City, its elected or appointed officials, employees, and agents are included as insureds with regard to damages and defense of claims arising from (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased, or used by the Named Insured.
2. **CONTRIBUTION NOT REQUIRED.** As respects: (a) work performed by the Named Insured for or on behalf of the City; or (b) products sold by the Named Insured to the City; or (c) premises leased by the Named Insured from the City, the insurance afforded by this policy shall be primary insurance as respects the City, its elected or appointed officials, employees, or agents; or stand in an unbroken chain of coverage excess of the Named Insured's schedule underlying primary coverage. In either event, any other insurance maintained by the City, its elected or appointed officials, employees or agents shall be in excess of this insurance and shall not contribute to it.
3. **SCOPE OF COVERAGE.** Affords coverage which is at least as broad as the primary insurance forms referenced in the preceding endorsements.
4. **SEVERABILITY OF INTEREST.** The insurance afforded by this policy applies separately to each insured which is seeking coverage or against whom a claim is made or a suit is brought, except with respects to the Company's limit of liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the City, its elected or appointed officials, employees, or agents.
6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be cancelled, nonrenwed, reduced in coverage, or materially changed in coverage or limits except after thirty (30) days' prior written notice by certified mail return receipt requested has been given to the City. Such notice shall be addressed as shown in the heading of this statement.

C. INCIDENT AND CLAIM REPORTING PROCEDURE

Incidents and claims are to be reported to the insurer at:

Attn:

Name and title

Department

Company

Address

City

State

Zip Code

() -
Telephone number

() -
Fax number

D. SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER

I, _____(print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

SIGNATURE OF AUTHORIZED REPRESENTATIVE (original signature required on endorsement furnished to the City)

TITLE: _____ DATE: _____

ADDRESS: _____

TELEPHONE: _____ FAX NUMBER: _____

Bid Protest Procedures

Section 1: Who May Protest

Only a bidder who has actually submitted a bid proposal is eligible to protest a bid. The City will not accept or entertain bid protests from manufacturers, vendors, suppliers, subcontractors or the like. A bidder may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest.

Section 2: Time for Protest

A bidder desiring to protest a bid shall file the protest within five (5) business days following the date on which bids were opened. The City Engineer must receive the protest by the close of business on the fifth (5th) business day following the bid opening.

Section 3: Form of Protest

The protest must be in writing and signed by the individual who signed the bid or, if the bidder is a corporation, by an officer of the corporation, and addressed to the City Engineer. A protest shall not be made by e-mail or fax and the City will not accept such. A protest must set forth a complete and detailed statement of the grounds for the protest and include all relevant information to support the grounds stated, must refer to the specific portion(s) of the Contract Documents upon which the protest is based, and shall include a valid e-mail address, street address and phone number sufficient to ensure the City's response will be received.

Section 4: Additional Information

Once the protest is received by the City Engineer, the City will not accept additional information on the protest unless the City itself requests it. In that case, the additional information must be submitted within three (3) business days after the request is made and must be received by the City Engineer by the close of business on the third (3rd) business day.

Section 5: City Response to Protest

The City Engineer or designee will respond, by e-mail and regular mail to the addresses provided in the protest, with a decision regarding the protest within ten (10) business days following receipt of the protest or, if applicable, the receipt of requested additional information. This decision shall be final.

Section 6: Limitation of Remedy

The procedure and time limits set forth herein are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. The bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.

Issued: _____

Director of Public Works

Date: _____

8/17/11

DIVISION E
FEDERAL, STATE &
LOCAL REQUIREMENTS

35891

PROJECT LABOR AGREEMENT

BY AND BETWEEN

THE CITY OF LONG BEACH

AND

LOS ANGELES/ORANGE COUNTIES

BUILDING AND CONSTRUCTION TRADES COUNCIL

AND THE SIGNATORY CRAFT COUNCILS AND UNIONS

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35891

CITY OF LONG BEACH
PROJECT LABOR AGREEMENT

This Project Labor Agreement (“Agreement”) is entered into effective as of May 6, 2021, pursuant to a minute order adopted by the City Council of the City of Long Beach at its meeting held on February ~~2~~, 2021, by and between the City of Long Beach, a municipal corporation (“City”), the Los Angeles/Orange Counties Building and Construction Trades Council (“Trades Council”), and the signatory Craft Councils and Local Unions signing this Agreement (collectively, the “Union” or “Unions”). This Agreement establishes the labor relations policies and procedures for the City, the Contractors awarded contracts for Project Work and for the crafts persons employed by the Contractors and represented by the Unions engaged in the Project Work as more fully described below. The City, Trades Council and Unions are hereinafter referred to herein, as the context may require, as “Party” or “Parties.”

It is understood by the Parties to this Agreement that for the duration of this Agreement, it shall be the policy of the City for all Project Work to be contracted exclusively to Contractors who agree to execute and be bound by the terms of this Agreement, directly or through the Letter of Assent (a form of which is attached as “Attachment A”), and to require each of its subcontractors, of whatever tier, to become bound. The City shall include, directly or by incorporation by reference, the requirements of this Agreement in the advertisement of and/or specifications for each and every contract for Project Work to be awarded by the City.

It is further understood that the City shall actively administer and enforce the obligations of this Agreement to ensure that the benefits envisioned from it flow to all signatory Parties, the Contractors and crafts persons working under it, and the residents of the City. The City shall therefore designate a “PLA Administrator,” either from its own staff or an independent contractor, to serve as the City’s liaison for Contractors and other persons; monitor compliance with this Agreement; assist, as the authorized representative of the City, in developing and implementing the programs referenced herein, all of which are critical to fulfilling the intent and purposes of the Parties and this Agreement; and to otherwise implement and administer this Agreement. For such purposes, each Contractor recognizes the PLA Administrator, its successors or assigns, as its agent; and together with City and the Unions, the PLA Administrator shall be considered a “negotiating party” of this Agreement.

ARTICLE 1
DEFINITIONS

Section 1.1 "Agreement" or "PLA" means this Project Labor Agreement.

Section 1.2 "Apprentice" means those employees indentured and participating in a Joint Labor/Management Apprenticeship Program approved by the State of California, Department of Industrial Relations, Division of Apprenticeship Standards.

Section 1.3 "Construction Contract" or "Construction Contracts" means any contract entered into by the City, as more fully described in Article 2.

Section 1.4 "Contractor" or "Subcontractor" or "Employer" means any individual firm, partnership or corporation, or combination thereof, including joint ventures, which is an independent business enterprise and which has entered into a Construction Contract with the City or any of its contractors or any of the City's or contractor's subcontractors of any tier, with respect to the construction of any part of a Project under contract terms and conditions approved by the City and which incorporate this Agreement.

Section 1.5 "City" means the City of Long Beach.

Section 1.6 "Joint Labor/Management Apprenticeship Program" means a joint Union and Contractor administered apprenticeship program certified by the State of California, Department of Industrial Relations, Division of Apprenticeship Standards.

Section 1.7 "Letter of Assent" means the document that each Contractor (of any tier) must sign and submit to the City before beginning any Project Work, which formally binds such Contractor(s) to adherence to all the forms, requirements and conditions of this Agreement in the form attached hereto as "**Attachment A.**"

Section 1.8 "Project", "Project Work" or "City Project" means the demolition and construction work to be performed on City property or within easements secured by the City consisting of the construction of public works, pursuant to a Construction Contract entered into by the City, as more fully described in Article 2.

Section 1.9 "Schedule A Agreements" means the local collective bargaining agreements (Master Labor Agreements) of the signatory Unions having jurisdiction over the Project Work and which have signed this Agreement.

Section 1.10 "Subscription Agreement" means the contract between a Contractor and a Union's Labor/Management Trust Fund(s) that allows the Contractor to make the appropriate fringe benefit contributions in accordance with the terms of Schedule A.

Section 1.11 The use of masculine or feminine gender or titles in this Agreement should be construed as including both genders and not as gender limitations unless the Agreement clearly requires a different construction. Further, the use of Article titles and/or Section headings are for information only, and carry no legal significance.

ARTICLE 2 SCOPE OF THE AGREEMENT

Section 2.1 General This Agreement shall apply and is limited to all of the City's Project Work, as specified in Section 2.2 of this Article, performed by those Contractor(s) of whatever tier that have contracts awarded for such work, for the development of the City's facilities which, jointly, constitute the Project, and have been designated by the City for construction or rehabilitation.

Section 2.2 Specific

- (a) The work covered by this Agreement shall be limited to any and all demolition, construction and rehabilitation work pursuant to prime multi-trade and specialty contracts and all subcontracts, of whatever tier, that flow from these contracts entered into by the City (excluding City Charter-commissioned departments, except for the Public Works Department, which shall be covered) that exceed seven hundred and fifty thousand dollars (\$750,000) for non-street/right of way projects and one million dollars (\$1,000,000) for street/right of way projects, and is not intended to, and shall not apply to any work performed at any time prior to the effective date, or after the expiration or termination of this Agreement, except as provided herein, or on other City projects. This Agreement shall in no way limit the City's right to terminate, modify or rescind any construction contract and/or any related subcontract or agreement. Should the City remove or terminate any contract or agreement for construction that does not fall within the scope of this Agreement and thereafter authorize that work be commenced on any contract for such construction, the contract for construction may, at the sole election of the City, be performed under the terms of this Agreement.
- (b) Work covered by this Agreement shall also include projects built by, with or for the City where the City has a "Proprietary Interest" in a project. For the purposes of this section 2.2, Proprietary Interest means: (1) the City provides (a) a cash payment, (b) transient occupancy tax rebate, (c) a loan with provisions conditionally forgiving interest or principal, or (d) real property for less than fair market value for that Project, and (2) the present value of that payment, rebate, loan or real property benefit exceeds one million dollars. This definition of Proprietary Interest excludes (1) projects conducted by, with or for a nonprofit or 501(c)(3) organization, and (2) City assisted or related developments, all of or a portion of which are subject to a recorded affordable housing restrictions.
- (c) Beginning after five (5) years from the effective date of this Agreement, the Parties shall meet and discuss potential changes to the thresholds reflected above in Section 2.2(a), with any agreement reached to be put in writing and signed by the Parties.

Section 2.3 Bundling of Contracts

- (a) The City, in its sole discretion, may seek to group (or "bundle") for bidding, contracts not meeting the threshold of Section 2.2 above. (Small contracts for like types of work, scheduled to be undertaken at the same facility or on the same project site, and within the same timeframe, will be considered for such bundling, consistent with economies of scale, and the purposes of this Agreement); and
- (b) Project Work will not be intentionally split, divided or otherwise separated for contract award purposes to avoid application of this Agreement.

Section 2.4 Applicability The Parties agree that this Agreement will be made available to, and will fully apply to, any successful bidder for Project Work, without regard to whether that successful bidder performs work at other sites on either a union or non-union basis. This Agreement shall not apply to any work of any Contractor other than that on Project Work specifically covered by this Agreement.

Section 2.5 Exclusions Items specifically excluded from the scope of this Agreement include the following:

(a) Work of non-manual employees, including but not limited to: superintendents; teachers; supervisors (except those covered by Schedule A Agreements above the level of general foreman); staff engineers; time keepers; mail carriers; clerks; office workers; messengers; guards; safety personnel; emergency medical and first aid technicians; and other professional, engineering, executive, administrative, supervisory and management employees;

(b) Equipment and machinery owned or controlled and operated by the City;

(c) All off-site manufacture and handling of materials, equipment or machinery; provided, however, that lay down or storage areas for equipment or material and manufacturing (prefabrication) sites, dedicated solely to the Project, and the movement of materials or goods between such locations and a Project site are within the scope of this Agreement;

(d) All work performed by City employees, the PLA Administrator, design teams (including, but not limited to architects engineers and master planners), or any other consultants for the City (including, but not limited to, project managers and construction managers and their employees were not engaged in Project Work) and their sub-consultants, and other employees of professional service organizations, not performing manual labor within the scope of this Agreement; provided, however, that it is understood and agreed that Building/Construction Inspector and Field Soils and Materials Testers (Inspectors) not employed by the City are a covered craft under the PLA. (This inclusion applies to the scope of work defined in the State of California Wage Determination for said Craft. This shall also specifically include such work where it is referred to by utilization of such terms as "quality control" or "quality assurance." Every Inspector performing under the Wage classification of Building/Construction Inspector and Field Soils and Material Testers under a professional services agreement of a construction contract shall be bound to all applicable requirements of the PLA.) Covered Work as defined by this Agreement shall be performed pursuant to the terms and conditions of this Agreement regardless of the manner in which the work was awarded;

(e) Any work performed near, or leading to a site of work covered by this Agreement and undertaken by state, county or other governmental bodies, or their Contractors; or by public utilities (including but not limited to Long Beach Water, Southern California Edison, any solar energy provider, etc.), or their Contractors; and/or by adjacent third party landowners; and/or by the City or its Contractors (for work which is not within the scope of this Agreement);

(f) Maintenance of leased equipment and on-site supervision of such work;

(g) Work by employees of a manufacturer or vendor supervising the work of Craft employees under this Agreement, necessary to maintain such manufacturer's or vendor's warranties or guaranty;

(h) Non-construction support services contracted by the City, City consultants, the PLA Administrator, or Contractor in connection with a Project;

(i) Laboratory work for testing;

(j) All work by employees of the City or its contractors involving services, operation and/or general maintenance and/or repair and/or cleaning work;

(k) All work performed by Long Beach Gas and Oil including, but not limited to gas pipeline work;

(l) All work pursuant to "as-needed" contracts with the City, including but not limited to individual projects performed under job order contracts (JOCs) that are below the dollar threshold specified in Section 2.2(a), notwithstanding a total not-to-exceed amount on a JOC above such dollar threshold; and

(m) All transportation of goods and materials to and from the project site except: (1) in those instances where it is necessary to set up a work area adjacent to the project site, then the transportation of goods and materials from the ancillary site to the project site will be covered under the Agreement, (2) the hauling of soil, sand, gravel, rocks, concrete, asphalt, excavation materials, and construction debris from a public works site to an outside disposal location will be covered under the Agreement, but the hauling of recyclable materials that have been separated from other materials at the jobsite prior to transportation and that are to be sold at fair market value to a bona fide purchaser will not be covered by the Agreement.

Section 2.6 Awarding of Contracts

(a) The City and/or the Contractors, as appropriate, have the absolute right to award contracts or subcontracts on Project Work to any Contractor notwithstanding the existence or non-existence of any agreements between such Contractor and any Union parties, provided only that such Contractor is ready, willing, and able to execute and comply with this Agreement should such Contractor be awarded work covered by this Agreement.

(b) It is agreed that all Contractors and subcontractors of whatever tier, who have been awarded contracts for work covered by this Agreement, shall be required to accept and be bound to the terms and conditions of this Agreement, and shall evidence their acceptance by the execution of the Letter of Assent set forth in "**Attachment A**" hereto, prior to the commencement of work. At the time that any Contractor enters into a subcontract with any subcontractor of any tier providing for the performance of the construction contract, the Contractor shall provide a copy of this Agreement to said subcontractor and shall require the subcontractor, as a part of accepting the award of a construction subcontract, to agree in writing in the form of a Letter of Assent to be bound by each and every provision of this Agreement

prior to the commencement of work on the Project. No Contractor or subcontractor shall commence Project Work without having first provided a copy of the Letter of Assent as executed by it to the PLA Administrator and to the Trades Council before the commencement of Project Work.

(c) The City agrees that to the extent permitted by law and consistent with the economy and efficiency of construction and operation, it will use its best efforts to purchase materials, equipment and supplies which will not create labor strife. Under all circumstances, however, the City shall retain the absolute right to select the lowest reliable and responsible bidder for the award of contracts on all projects.

Section 2.7 Coverage Exception

(a) This Agreement shall not apply if the City receives funding or assistance from any Federal, State, local or other public entity for the Construction Contract if a requirement, condition or other term of receiving that funding or assistance, at the time of the awarding of the contract, is that the City not require, bidders, contractors, subcontractors or other persons or entities to enter into an agreement with one or more labor organizations. The City agrees that it will make every effort to establish the enforcement of this Agreement with any governmental agency or granting authority.

(b) In case of conflict other than those stated in Section 2.7(a), where particular provisions of this Agreement would be prohibited by Federal or State law, or where the application of this Agreement would violate or be inconsistent with the terms, conditions or contingencies of a grant or a contract with an agency of the United States or the State of California, then the PLA Administrator shall adapt requirements of this Agreement into a set of contract provisions that advance the purposes of this Agreement to the maximum extent feasible without conflicting with Federal or State law or with terms, conditions or contingencies of the State or Federal grant or contract in question. The City shall include this set of contract provisions in the public works or improvement contract with regard to the project or portions of the project for which this Agreement would conflict with Federal or State requirements.

(c) Should City partner with another public agency wherein City and such other public agency jointly fund or construct a Project which would otherwise be considered a "Covered Project" under the terms of this Agreement, the Unions agree to meet and discuss the application of the terms and conditions of this Agreement to such other Project with such other public agency. In the event the public agency partner does not agree to be bound by the terms of this Agreement, the said project shall be exempt from this Agreement.

(d) The Parties or the Trades Council, together and/or separately, shall not be precluded from entering into other project labor agreements, that are separate and apart from this Agreement, for specific City projects including but not limited to future projects such as for the new Belmont Plaza Pool, which may supersede and override this Agreement in its entirety.

(e) Should the City receive funding or assistance from any federal agency that prohibits the use of a geographic-based hiring preference, then such geographic-based hiring

preferences, as set forth in Sections 3.5, 3.6, 3.8 and 14.1 herein, shall not apply to the work funded by such federal source.

Section 2.8 Schedule A's

(a) The provisions of this Agreement, including the Schedule A's (which are the local Master Labor Agreements of the signatory Unions having jurisdiction over the work on the Project, as such may be changed from time-to-time and which are incorporated herein by reference), shall apply to the work covered by this Agreement, notwithstanding the provisions of any other local, area and/or national agreement which may conflict with or differ from the terms of this Agreement. However, such does not apply to work performed under the National Cooling Tower Agreement, the National Stack Agreement, the National Transit Division Agreement (NTD), or within the jurisdiction of the International Union of Elevator Constructors and all instrument calibration and loop checking work performed under the terms of the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, except that Articles dealing with Work Stoppages and Lock-Outs, Work Assignments and Jurisdictional Disputes, and Settlement of Grievances and Disputes shall apply to such work. It is specifically agreed that no later agreement shall be deemed to have precedence over this Agreement unless signed by all Parties signatory hereto who are then currently employed or represented at the Project. Where a subject covered by the provisions of this Agreement is also covered by a Schedule A, the provisions of this Agreement shall apply. Where a subject is covered by a provision of a Schedule A and not covered by this Agreement, the provisions of the Schedule A shall prevail. Any dispute as to the applicable source between this Agreement and any Schedule A for determining the wages, hours of working conditions of employees on this Project shall be resolved under the procedures established in Article 10.

(b) It is understood that this Agreement, together with the referenced Schedule A's, constitutes a self-contained, stand-alone agreement and by virtue of having become bound to this Agreement, the Contractor will not be obligated to sign any other local, area or national collective bargaining agreement as a condition of performing work within the scope of this Agreement (provided, however, that the Contractor may be required to sign a uniformly applied, non-discriminatory Participation or Subscription Agreement at the request of the trustees or administrator of a trust fund established pursuant to Section 302 of the Labor Management Relations Act, and to which such Contractor is bound to make contributions under this Agreement, provided that such Participation Agreement does not purport to bind the Contractor beyond the terms and conditions of this Agreement and/or expand its obligation to make contributions pursuant thereto). It shall be the responsibility of the prime Contractor to have each of its subcontractors sign the documents described herein, with the appropriate Craft Union prior to the subcontractor beginning work on covered Projects.

Section 2.9 Workers' Compensation Carve-out The Parties recognize the potential which the Project Work may provide for the implementation of a cost effective workers' compensation system, as permitted by revised California Labor Code Section 3201.5, and it is understood that the City is in an ongoing review of the value of such a program. Should the City request, the Union parties agree to meet and negotiate in good faith with representatives of the City for the development, and subsequent implementation, of an effective program involving improved and

revised dispute resolution and medical care procedures for the delivery of workers' compensation benefits and medical coverage as permitted by the California Labor Code.

Section 2.10 Binding Signatories Only This Agreement shall only be binding on the signatory Parties hereto, and shall not apply to the parents, affiliates, subsidiaries, or other ventures of any such Party not performing Project Work.

Section 2.11 Other City Work This Agreement shall be limited to the construction work within the scope of this Agreement including, specifically, site preparation and related demolition work, and new construction and major rehabilitation work for new or existing facilities referenced in Section 2.2 above. Nothing contained herein shall be interpreted to prohibit, restrict, or interfere with the performance of any other operation, work or function not covered by this Agreement, which may be performed by City employees or contracted for by the City for its own account, on its property or in and around a Project site.

Section 2.12 Separate Liability It is understood that the liability of the Contractor(s) and the liability of the separate Unions under this Agreement shall be several and not joint. The Unions agree that this Agreement does not have the effect of creating any joint employment status between or among the City or PLA Administrator and/or any Contractor.

Section 2.13 Completed Project Work As areas of covered work are accepted by the City, this Agreement shall have no further force or effect on such items or areas except where the Contractor is directed by the City or its representatives to engage in repairs, modification, check-out and/or warranties functions required by its contract(s) with the City.

Section 2.14 Progress Reports City staff will provide annual reports to the City Council detailing the progress made in meeting the stated goals of this Agreement.

ARTICLE 3 UNION RECOGNITION AND EMPLOYMENT

Section 3.1 Recognition The Contractor recognizes the Trades Council and the Unions as the sole and exclusive bargaining representative for the employees engaged in Project Work. Contractors further recognize that the Unions shall be the primary source of all craft labor employed on the Projects. In the event that a Contractor has its own core workforce, said Contractor shall follow the procedures outlined below.

Section 3.2 Contractor Selection of Employees The Contractor shall have the right to determine the competency of all employees, the number of employees required, the duties of such employees within their craft jurisdiction, and shall have the sole responsibility for selecting employees to be laid off, consistent with Section 3.3 and Section 4.3, below. The Contractor shall also have the right to reject any applicant referred by a Union for any reason subject to Section 3.4 herein, and subject to any reporting pay required by Section 6.6; provided, however, that such right is exercised in good faith and not for the purpose of avoiding the Contractor's commitment to employ qualified workers through the procedures endorsed in this Agreement.

Section 3.3 Referral Procedures

(a) For signatory Unions now having a job referral system contained in a Schedule A, the Contractor agrees to comply with such system and it shall be used exclusively by such Contractor, except as modified by this Agreement. Such job referral system will be operated in a nondiscriminatory manner and in full compliance with federal, state, and local laws and regulations which require equal employment opportunities and non-discrimination. All of the foregoing hiring procedures, including related practices affecting apprenticeship, shall be operated so as to consider the goals of the City to encourage employment of City residents and utilization of small local businesses on the Project, and to facilitate the ability of all Contractors to meet their employment needs.

(b) The local Unions will exert their best efforts to recruit and refer sufficient numbers of skilled craft workers to fulfill the labor requirements of the Contractor, including specific employment obligations to which the Contractor may be legally and/or contractually obligated; and to refer apprentices as requested to develop a larger, skilled workforce. The Unions will work with their affiliated regional and national unions, and jointly with the PLA Administrator and others designated by the City, to identify and refer competent craft persons as needed for Project Work, and to identify and hire individuals, particularly residents of the City, for entrance into joint labor/management apprenticeship programs, or to participate in other identified programs and procedures to assist individuals in qualifying and becoming eligible for such apprenticeship programs, all maintained to increase the available supply of skilled craft personnel for Project Work and future construction of maintenance work to be undertaken by the City.

(c) The Union shall not knowingly refer an employee currently employed by a Contractor on a covered Project to any other Contractor.

Section 3.4 Non-Discrimination in Referral, Employment, and Contracting The Unions and Contractors agree that they will not discriminate against any employee or applicant for employment in hiring and dispatching on the basis of race, color, religion, sex, gender, gender identity/expression, national origin, age, membership in a labor organization, sexual orientation, political affiliation, marital status, military or veteran status, medical condition, genetic information, or disability. Further, it is recognized that the City has certain policies, programs, and goals for the utilization of local small business enterprises. The Parties shall jointly endeavor to assure that these commitments are fully met, and that any provisions of this Agreement which may appear to interfere with local small business enterprises successfully bidding for work within the scope of this Agreement shall be carefully reviewed, and adjustments made as may be appropriate and agreed upon among the Parties, to ensure full compliance with the spirit and letter of the City's policies and commitment to its goals for the significant utilization of local small businesses as direct Contractors or suppliers for Project Work.

Section 3.5 Employment of City Residents

(a) The Unions and Employers agree that, to the extent allowed by law, and as long as they possess the requisite skills and qualifications, the Unions will exert their best efforts to

refer and/or recruit sufficient numbers of skilled craft “Local Residents” as defined herein, to fulfill the requirements of the Employers. In recognition of the fact that the City and the communities surrounding Project Work will be impacted by the construction of the Project Work, the parties agree to support the hiring of workers from the residents of these surrounding areas. Towards that end, the Unions shall exert their best efforts to encourage and provide referrals and utilization of qualified workers residing in those first tier zip codes which include all of the City of Long Beach, as set forth in “**Attachment B**” attached hereto. If the Unions cannot provide the Employers in the attainment of a sufficient number of Local Residents from within the first tier zip codes, the Unions shall exert their best efforts to then recruit and identify for referral Local Residents residing in second tier zip codes which reflect the Gateway Cities, as set forth in “**Attachment B**” attached hereto. If the Unions still have not provided the Employers in the attainment of a sufficient number of Local Residents, the Unions shall then exert their best efforts to recruit and identify for referral Local Residents residing within Orange and Los Angeles counties.

(1) Where Project Work is funded in full or in part by State of California Tideland funds, the term Local Resident, as used in this section, shall mean an individual whose primary place of residence is within the Counties of Los Angeles or Orange.

(b) A goal of 40% of the total work hours shall be from workers residing within the areas described in (a) above.

(c) The City is in the process of establishing referral mechanisms to ensure the recruitment, training and placement of Transitional Workers and veterans into apprentice programs, with a goal of 10% of such Transitional Workers and veterans being placed from such programs. “Transitional Workers” means an individual who, prior to commencing work on the project, faces one of the following barriers to employment: (1) being homeless; (2) being a custodial single parent; (3) receiving public assistance; (4) lacking a GED or high school diploma; (5) having a criminal record or other involvement with the criminal justice system; (6) suffering from chronic unemployment ; (7) emancipated from the foster care system; (8) being a veteran of the Iraq/Afghanistan war.

(d) The Trades Council agrees to support the operation of pre-apprentice referral programs in Long Beach. Further, the Unions agree to place on their referral roles or in their apprenticeship training programs, as appropriate and needed, qualified persons sent to them by the PLA Administrator, the Building Trades non-profit Apprenticeship Readiness Fund’s: Apprenticeship Readiness Coordinator and Apprenticeship Coordinator for the Long Beach Unified School District. This shall include, but is not limited to, those individuals who have received an MC3 completion certificate from an apprenticeship preparation program that utilizes the Building Trades multi-craft core curriculum (MC3) including, but not limited to, the Long Beach Community College District’s MC3 Pre-Apprenticeship Program. Such individuals must meet the qualifications and minimum requirements for the respective craft Union, or their respective apprenticeship or training programs, in order to be placed on the referral roles or placed into such apprenticeship or training programs.

Section 3.6 Requirements on Contractors

(a) To facilitate the dispatch of Local Residents, Transitional Workers and veterans, all Contractors will be required to utilize the Craft Employee Request Form whenever they are requesting the referral of any employee from a Union referral list for any Covered Project, a sample of which is attached as “Attachment C.” This form must also be sent to the PLA Administrator at Pacific Gateway at the time of request. When Local Residents, Transitional Workers and veterans are requested by the Employers, the Unions will refer such workers regardless of their place in the Unions’ hiring halls’ list and normal referral procedures.

(b) The City will require the prime contractor to hire a “Jobs Coordinator” who shall provide additional outreach efforts in connecting Long Beach residents with job opportunities. The term Jobs Coordinator means an independent third-party individual, entity or employee with whom the prime contractor enters into a contract or employs to facilitate implementation of the targeted hiring requirements of the PLA. The Jobs Coordinator must be able to demonstrate or document to the City the requisite qualifications and/or experience to fulfill the duties and responsibilities as outlined in PLA.

(c) All Contractors shall use a skilled and trained workforce, as defined and in accordance with Public Contract Code section 2601, in the performance of all Project Work.

Section 3.7 Helmets to Hardhats The Employers and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The employers and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter “Center”) and the Center’s “Helmets to Hardhats” program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the Parties. For purposes of this Agreement the term “Eligible Veteran” shall have the same meaning as the term “veteran” as defined under Title 5, Section 2108(1) of the United States Code as the same may be amended or re-codified from time to time. It shall be the responsibility of each qualified applicant to provide the Unions with proof of his/her status as an Eligible Veteran.

The Unions and Employers agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on this Project and of apprenticeship and employment opportunities for this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

Section 3.8 Core Employees

(a) Except as otherwise provided in separate collective bargaining agreement(s) to which the Contractor is signatory, Contractors may employ, as needed, first, a member of his core workforce, then an employee through a referral from the appropriate Union hiring hall, then a second core employee, then a second employee through the referral system, and so on until a maximum of five (5) core employees are employed, thereafter, all additional employees in the

affected trade or craft shall be requisitioned from the craft hiring hall in accordance with Section 3.3. In the laying off of employees, the number of core employees shall not exceed one-half plus one of the workforce for an employer with 10 or fewer employees, assuming the remaining employees are qualified to undertake the work available. This provision applies only to employees not currently working under a current Schedule A Agreement and is not intended to limit the transfer provisions of the Schedule A Agreement of any trade. As part of this process, and in order to facilitate the contract administration procedures, as well as appropriate fringe benefit fund coverage, all Contractors shall require their core employees and any other persons employed other than through the referral process, to register with the appropriate Union hiring hall, if any, prior to their first day of employment at a project site.

(b) The core work force is comprised of those employees whose names appeared on the Contractor's active payroll for sixty (60) of the one hundred (100) working days immediately before award of Project Work to the Contractor; who possess any license required by state or federal law for the Project Work to be performed; who have worked at least two thousand (2,000) hours in the three years prior to project award in the applicable trade or craft in which they are employed; who have the ability to safely perform the basic functions of the applicable trade and who have been residing within the first or second tier zip codes described in Section 3.5(a) for the one hundred (100) working days immediately prior to the award of Project Work to the Contractor.

(c) Prior to each Contractor performing any work on the Project, each Contractor shall provide a list of his core employees to the PLA Administrator and the Trades Council. Failure to do so will prohibit the Contractor from using any core employees. Upon request by any Party to this Agreement, the Contractor hiring any core employee shall provide satisfactory proof (i.e., payroll records, quarterly tax records, driver's license, voter registration, postal address and such other documentation) evidencing the core employee's qualification as a core employee to the PLA Administrator and the Trades Council.

(d) The provisions of this Section 3.8 shall only apply to employees who are not working under the terms of a Schedule A Agreement at the time of their transfer to work covered under this Agreement and is not intended to limit the transfer provisions of the Schedule A Agreements of any of the Unions signatory hereto.

Section 3.9 Time for Referral If any Union's registration and referral system does not fulfill the requirements for specific classifications requested by any Contractor within forty-eight (48) hours (excluding Saturdays, Sundays and holidays), that Contractor may use employment sources other than the Union registration and referral services and may employ applicants meeting such standards from any other available source. The Contractors shall inform the Union of any applicants hired from other sources within forty-eight (48) hours of such applicant being hired, and such applicants shall register with the appropriate hiring hall, if any, before commencing work.

Section 3.10 Lack of Referral Procedure If a signatory Union does not have a job referral system as set forth in Section 3.3 above, the Contractors shall give the Union equal opportunity

to refer applicants. Contractors shall notify the Union of employees so hired, as set forth in Section 3.5.

Section 3.11 Union Membership Employees are not required to become or remain union members as a condition of performing Covered Work under this Agreement. Employers shall make and transmit all deductions for union dues, fees, and assessments that have been authorized by employees in writing in accordance with the applicable Master Agreement. Nothing in this Section 3.11 is intended to supersede the requirements of applicable Master Agreements as to those Employers otherwise signatory to such Master Agreements and as to the employees of those Employers who are performing Covered Work.

Section 3.12 Individual Seniority Except as provided in Section 4.3, individual seniority shall not be recognized or applied to employees working on the Project; provided, however, that group and/or classification seniority in a Union's Schedule A as of the effective date of this Agreement shall be recognized for purposes of layoffs.

Section 3.13 Foremen The selection and number of craft foreman and/or general foreman shall be the responsibility of the Contractor. All foremen shall take orders exclusively from the designated Contractor representatives. Craft foreman shall be designated as working foreman at the request of the Contractors.

Section 3.14 Out of State Workers In determining compliance with the targeted hiring goals of Section 3.5 above, hours of Project Work performed by residents of states other than California will be excluded from the calculation. Additionally, the residency requirement in Section 3.8(b) shall not apply to workers residing out of state.

ARTICLE 4 UNION ACCESS AND STEWARDS

Section 4.1 Access to Project Sites Authorized representatives of the Union shall have access to Project Work sites, provided that they do not interfere with the work of employees and further provided that such representatives fully comply with posted visitor, security and safety rules.

Section 4.2 Stewards

(a) Each signatory Union shall have the right to dispatch a working journeyman as a steward for each shift, and shall notify the Contractor in writing of the identity of the designated steward or stewards prior to the assumption of such person's duties as steward. Such designated steward or stewards shall not exercise any supervisory functions. There will be no non-working stewards. Stewards will receive the regular rate of pay for their respective crafts.

(b) In addition to his/her work as an employee, the steward should have the right to receive, but not to solicit, complaints or grievances and to discuss and assist in the adjustment of the same with the employee's appropriate supervisor. Each steward should be concerned only with the employees of the steward's Contractor and, if applicable, subcontractor(s), and not with

the employees of any other Contractor. A Contractor will not discriminate against the steward in the proper performance of his/her Union duties.

(c) When a Contractor has multiple, non-contiguous work locations at one site, the Contractor may request and the Union shall appoint such additional working stewards as the Contractor requests to provide independent coverage of one or more such locations. In such cases, a steward may not service more than one work location without the approval of the Contractor.

(d) The stewards shall not have the right to determine when overtime shall be worked or who shall work overtime.

Section 4.3 Steward Layoff/Discharge Contractor agrees to notify the appropriate Union twenty-four (24) hours before the layoff of a steward, except in the case of disciplinary discharge for just cause. If the steward is protected against such layoff by the provisions of the applicable Schedule A, such provisions shall be recognized when the steward possesses the necessary qualifications to perform the remaining work. In any case in which the steward is discharged or disciplined for just cause, the appropriate Union will be notified immediately by the Contractor, and such discharge or discipline shall not become final (subject to any later filed grievance) until twenty-four (24) hours after such notice has been given.

Section 4.4 Employees on Non-Project Work On work where the personnel of the City may be working in close proximity to the construction activities covered by this Agreement, the Union agrees that the Union representatives, stewards, and individual workers will not interfere with the City personnel, or with personnel employed by any other employer not a Party to this Agreement.

ARTICLE 5 WAGES AND BENEFITS

Section 5.1 Wages All employees covered by this Agreement shall be classified in accordance with work performed and paid by the Contractors the hourly wage rates for those classifications in compliance with the applicable prevailing wage rate determination established pursuant to applicable law. If a prevailing rate increases under law, the Contractor shall pay that rate as of its effective date under the law. This Agreement does not relieve Contractors from any independent contractual or other obligation they may have to pay wages in excess of the prevailing wage rate as required.

Section 5.2 Benefits

(a) Contractors shall pay contributions to the established employee benefit funds in the amounts designated in the appropriate Schedule A and make all employee-authorized deductions in the amounts designated in the appropriate Schedule A, however, such contributions shall not exceed the contribution amounts set forth in the applicable prevailing wage determination. Notwithstanding Section 2.8(a) herein, Contractors that are direct signatories to one or more of the Schedule A Agreements are required to make all contributions set forth in

those Schedule A Agreements without reference to the foregoing. Bona fide jointly-trusted benefit plans or authorized employee deduction programs established or negotiated under the applicable Schedule A or by the Parties to this Agreement during the life of this Agreement may be added.

(b) The Contractor adopts and agrees to be bound by the written terms of the applicable, legally established, trust agreement(s) specifying the detailed basis on which payments are to be made into, and benefits paid out of, such trust funds for its employees. The Contractor authorizes the Parties to such trust funds to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor.

(c) Each Contractor and subcontractor is required to certify to the PLA Administrator that it has paid all benefit contributions due and owing to the appropriate Trust(s) prior to the receipt of its final payment and/or retention. Further, upon timely notification by a Union to the PLA Administrator, the PLA Administrator shall work with any prime Contractor or subcontractor who is delinquent in payments to assure that proper benefit contributions are made, to the extent of requesting the City or the prime Contractor to withhold payments otherwise due such Contractor, until such contributions have been made or otherwise guaranteed.

Section 5.3 Wage Premiums Wage premiums, including but not limited to pay based on height of work, hazard pay, scaffold pay and special skills shall not be applicable to work under this Agreement, except to the extent provided for in any applicable prevailing wage determination.

ARTICLE 6 HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 6.1 Hours of Work Eight (8) hours per day between the hours of 6:00 a.m. and 5:30 p.m., plus one-half (½) hour unpaid lunch approximately mid-way through the shift, shall constitute the standard work day. Forty (40) hours per week shall constitute a regular week's work. The work week will start on Sunday and conclude on Saturday. The foregoing provisions of this Article are applicable unless otherwise provided in the applicable prevailing wage determination, or unless changes are permitted by law and such are agreed upon by the Parties. Nothing herein shall be construed as guaranteeing any employee eight (8) hours per day or forty (40) hours per week, or a Monday through Friday standard work schedule.

Section 6.2 Place of Work Employees shall be at their place of work (as designated by the Contractor), at the starting time and shall remain at their place of work, performing their assigned functions, until quitting time. The place of work is defined as the gang or tool box or equipment at the employee's assigned work location or the place where the foreman gives instructions. The Parties reaffirm their policy of a fair day's work for a fair day's wage. Except as indicated in Section 6.6, there shall be no pay for time not worked unless the employee is otherwise engaged at the direction of the Contractor.

Section 6.3 Overtime Overtime shall be paid in accordance with the requirements of the applicable prevailing wage determination. There shall be no restriction on the Contractor's scheduling of overtime or the nondiscriminatory designation of employees who will work overtime. There shall be no pyramiding of overtime (payment of more than one form of overtime compensation for the same hour) under any circumstances.

Section 6.4 Shifts and Alternate Work Schedules

(a) Alternate starting and quitting time and/or shift work may be performed at the option of the Contractor upon three (3) days' prior notice to the affected Union(s), unless a shorter notice period is provided for in the applicable Schedule A. If two shifts are worked, each shall consist of eight (8) hours of continuous work exclusive of a one-half (½) hour non-paid lunch period, for eight (8) hours pay. The last shift shall start on or before 6:00 p.m. The first shift starting at or after 6:00 a.m. is designated as the first shift, with the second shift following.

(b) Contractors, the Trades Council and the Union recognize the economic impact upon the City and City residents of the Project being undertaken by the City and agree that all Parties to this Agreement desire and intend Project Work to be undertaken in a cost efficient and effective manner to the highest standard of quality and craftsmanship. Recognizing the economic conditions, the Parties agree that, except to the extent permitted by law, employees performing Project Work shall not be entitled to any differentials or additional pay based upon the shift or work schedule of the employees. Instead, all employees working on Project Work shall be paid at the same base rate regardless of shift or work schedule worked.

(c) Because of operational necessities, the second shift may, at the City's direction, be scheduled without the preceding shift having been worked. It is recognized that the City's operations and/or mitigation obligations may require restructuring of normal work schedules. Except in an emergency or when specified in the City's bid specification, the Contractor shall give affected Union(s) at least three (3) days' notice of such schedule changes.

Section 6.5 Holidays Recognized holidays on this Project shall be those set forth and governed by the prevailing wage determination(s) applicable to this Project.

Section 6.6 Show-up Pay

(a) Except as otherwise required by State law, Employees reporting for work and for whom no work is provided, except when given prior notification not to report to work, shall receive two (2) hours pay at the regular straight time hourly rate. Employees who are directed to start work shall receive four (4) hours of pay at the regular straight time hourly rate. Employees who work beyond four (4) hours shall be paid for actual hours worked. Whenever reporting pay is provided for employees, they will be required to remain at the Project Site and available for work for such time as they receive pay, unless released earlier by the principal supervisor of the Contractor(s) or his/her designated representative. Each employee shall furnish his/her Contractor with his/her current address and telephone number, and shall promptly report any changes to the Contractor.

(b) An employee called out to work outside of his/her shift shall receive a minimum of two (2) hours pay at the appropriate rate. This does not apply to time worked as an extension of (before or after) the employee's normal shift.

(c) When an employee leaves the job or work location of his/her own volition, or is discharged for cause or is not working as a result of the Contractor's invocation of Section 12.2 herein, the employee shall only be paid for actual time worked.

Section 6.7 Meal Periods The Contractor will schedule a meal period of no more than one-half hour duration at the work location at approximately mid-point of the schedule shift; provided, however, that the Contractor may, for efficiency of the operation, establish a schedule which coordinates the meal periods of two or more crafts. An employee may be required to work through his/her meal period because of an emergency or a threat to life or property, or for such other reasons as are in the applicable Schedule A, and if he/she is so required, he/she shall be compensated in the manner established in the applicable Schedule A.

Section 6.8 Make-up Days To the extent permitted by the applicable general wage determination, when an employee has been prevented from working for reasons beyond the control of the employer, including, but not limited to inclement weather or other natural causes, during the regularly scheduled work week, a make-up day may be worked on a non-regularly scheduled work day for which an employee shall receive eight (8) hours pay at the straight time rate of pay or any premium rate required for such hours under the state prevailing wage law.

ARTICLE 7 WORK STOPPAGES AND LOCK-OUTS

Section 7.1 No Work Stoppages or Disruptive Activity The Trades Council and the Unions signatory hereto agree that neither they, and each of them, nor their respective officers or agents or representatives, shall incite or encourage, condone or participate in any strike, walk-out, slow-down, picketing, observing picket lines or other activity of any nature or kind whatsoever, for any cause or dispute whatsoever with respect to or in any way related to Project Work, or which interferes with or otherwise disrupts, Project Work, or with respect to or related to the City or Contractors or subcontractors, including, but not limited to, economic strikes, unfair labor practice strikes, safety strikes, sympathy strikes and jurisdictional strikes whether or not the underlying dispute is arbitrable. Any such actions by the Trades Council, or Unions, or their members, agents, representatives or the employees they represent shall constitute a violation of this Agreement. The Trades Council and the Union shall take all steps necessary to obtain compliance with this Article and neither should be held liable for conduct for which it is not responsible.

Section 7.2 Employee Violations The Contractor may discharge any employee violating Section 7.1 above and any such employee will not be eligible for rehire under this Agreement.

Section 7.3 Standing to Enforce The City, the PLA Administrator, or any Contractor affected by an alleged violation of Section 7.1 shall have standing and the right to enforce the obligations established therein.

Section 7.4 Expiration of Schedule A's If the Schedule A Agreement, or any local, regional, and other applicable collective bargaining agreements expire during the term of the Project, the Union(s) agree that there shall be no work disruption of any kind as described in Section 7.1 above as a result of the expiration of any such agreement(s) having application on this Project and/or failure of the involved Parties to that agreement to reach a new contract. Terms and conditions of employment established and set at the time of bid shall remain established and set. Otherwise to the extent that such agreement does expire and the parties to that agreement have failed to reach concurrence on a new contract, work will continue on the Project on one of the following two (2) options, both of which will be offered by the Unions involved to the Contractors affected:

(a) Each of the Unions with a contract expiring must offer to continue working on the Project under interim agreements that retain all the terms of the expiring contract, except that the Unions involved in such expiring contract may each propose wage rates and employer contribution rates to employee benefit funds under the prior contract different from what those wage rates and employer contributions rates were under the expiring contracts. The terms of the Union's interim agreement offered to Contractors will be no less favorable than the terms offered by the Union to any other employer or group of employers covering the same type of construction work in Los Angeles County.

(b) Each of the Unions with a contract expiring must offer to continue working on the Project under all the terms of the expiring contract, including the wage rates and employer contribution rates to the employee benefit funds, if the Contractor affected by that expiring contract agrees to the following retroactive provisions: if a new Schedule A Agreement, local, regional or other applicable labor agreement for the industry having application at the Project is ratified and signed during the term of this Agreement and if such new labor agreement provides for retroactive wage increases, then each affected Contractor shall pay to its employees who performed work covered by this Agreement at the Project during the hiatus between the effective dates of such expired and new labor agreements, an amount equal to any such retroactive wage increase established by such new labor agreement, retroactive to whatever date is provided by the new labor agreement for such increase to go into effect, for each employee's hours worked on the Project during the retroactive period. All Parties agree that such affected Contractors shall be solely responsible for any retroactive payment to its employees.

(c) Some Contractors may elect to continue to work on the Project under the terms of the interim agreement option offered under paragraph (a) above and other Contractors may elect to continue to work on the Project under the retroactivity option offered under paragraph (b) above. To decide between the two options, Contractors will be given one week after the particular labor agreement has expired or one week after the Union has personally delivered to the Contractors in writing its specific offer of terms of the interim agreement pursuant to paragraph (a) above, whichever is the later date. If the Contractor fails to timely select one of the two options, the Contractor shall be deemed to have selected option (b).

Section 7.5 No Lockouts Contractors shall not cause, incite, encourage, condone or participate in any lock-out of employees with respect to Project Work during the term of this Agreement. The term "lock-out" refers only to a Contractor's exclusion of employees in order to

secure collective bargaining advantage, and does not refer to the discharge, termination or layoff of employees by the Contractor for any reason in the exercise of rights pursuant to any provision of this Agreement, or any other agreement, nor does “lock-out” include the City’s decision to stop, suspend or discontinue any Project Work or any portion thereof for any reason.

Section 7.6 Best Efforts to End Violations

(a) If a Contractor contends that there is any violation of this Article or Section 8.3, it shall notify, in writing, the Executive Secretary of the Trades Council, the Senior Executive of the involved Union(s) and the PLA Administrator. The Executive Secretary and the leadership of the involved Union(s) will immediately instruct, order and use their best efforts to cause the cessation of any violation of the relevant Article.

(b) If the Union contends that any Contractor has violated this Article, it will notify the Contractor and the PLA Administrator, setting forth the facts which the Union contends violate the Agreement, at least twenty-four (24) hours prior to invoking the procedures of Section 7.8. The PLA Administrator shall promptly order the involved Contractor(s) to cease any violation of the Article.

Section 7.7 Withholding of services for failure to pay wages and fringe benefits

Notwithstanding any provision of this Agreement to the contrary, it shall not be a violation of this Agreement for any Union to withhold the services of its members (but not the right to picket) from a particular Contractor who:

(a) fails to timely pay its weekly payroll; or

(b) fails to make timely payments to the Union’s Joint Labor/Management Trust Funds in accordance with the provisions of the applicable Schedule A Agreements. Prior to withholding its members services for the Contractor’s failure to make timely payments to the Union’s Joint Labor/Management Trust Funds, the Union shall give at least ten (10) days (unless a lesser period of time is provided in the Union’s Schedule A Agreement, but in no event less than forty-eight (48) hours) written notice of such failure to pay by registered or certified mail, return receipt requested, and by facsimile transmission to the involved Contractor and to the City. Union will meet within the ten (10) day period to attempt to resolve the dispute.

(c) Upon the payment of the delinquent Contractor of all monies due and then owing for wages and/or fringe benefit contributions, the Union shall direct its members to return to work and the Contractor shall return all such members back to work.

Section 7.8 Expedited Enforcement Procedure Any party, including the City, which the Parties agree is a Party to the Agreement for purposes of this Article and an intended beneficiary of this Article, or the PLA Administrator, may institute the following procedures, in lieu of or in addition to any other action at law or equity, when a breach of Section 7.1 or 7.5, above, or Section 8.3 is alleged.

(a) The Party invoking this procedure shall notify the person named in “**Attachment D**”, who has been selected by the negotiating Parties, and whom the Parties agree shall be the permanent arbitrator under this procedure. If the permanent arbitrator is unavailable at any time, the party invoking this procedure shall notify one of the alternates selected by the Parties, as set forth under section 10.2, Step 3 (a), in that order on an alternating basis. Expenses incurred in arbitration shall be borne equally by the Parties involved in the arbitration and the decision of the arbitrator shall be final and binding on the Parties, provided, however, that the arbitrator shall not have the authority to alter or amend or add to or delete from the provisions of this Agreement in any way. Notice to the arbitrator shall be by the most expeditious means available, with notices to the Parties alleged to be in violation, and to the Trades Council if it is a Union alleged to be in violation. For purposes of this Article, written notice may be given by telegram, facsimile, hand delivery or overnight mail and will be deemed effective upon receipt.

(b) Upon receipt of said notice, the arbitrator named above or his/her alternate shall sit and hold a hearing within twenty-four (24) hours if it is contended that the violation still exists, but not sooner than twenty-four (24) hours after notice has been dispatched to the Executive Secretary and the Senior Official(s) as required by Section 7.6, as above.

(c) The arbitrator shall notify the Parties of the place and time chosen for this hearing. Said hearing shall be completed in one session, which, with appropriate recesses at the arbitrator’s discretion, shall not exceed 24 hours unless otherwise agreed upon by all Parties. A failure of any Party or Parties to attend said hearings shall not delay the hearing of evidence or the issuance of any award by the arbitrator.

(d) The sole issue at the hearing shall be whether or not a violation of Sections 7.1 or 7.5, above, or Section 8.3 herein has in fact occurred. The arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, (except for damages as set forth in 7.8 below) which issue is reserved for court proceedings, if any. The award shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without an opinion. If any Party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the Award. The arbitrator may order cessation of the violation of the Article and other appropriate relief, and such award shall be served on all Parties by hand or registered mail upon issuance.

(e) Such award shall be final and binding on all Parties and may be enforced by any court of competent jurisdiction upon the filing of this Agreement and all other relevant documents referred to herein above in the following manner. Written notice of the filing of such enforcement proceedings shall be given to the other Party. In any judicial proceeding to obtain a temporary order enforcing the arbitrator’s award as issued under Section 7.7(d) of this Article, all Parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any Party’s right to participate in a hearing for a final order of enforcement. The court’s order or orders enforcing the arbitrator’s award shall be served on all Parties by hand or by delivery to their address as shown on this Agreement (for a Union), as shown on their business contract for work under this Agreement (for a Contractor) and to the

representing Union (for an employee), by certified mail by the Party or Parties first alleging the violation.

(f) Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance hereto are hereby waived by the Parties to whom they accrue.

(g) The fees and expenses of the arbitrator shall be equally divided between the Party or Parties initiating this procedure and the respondent Party or Parties.

ARTICLE 8 WORK ASSIGNMENTS AND JURISDICTIONAL DISPUTES

Section 8.1 Assignment of Work The assignment of Project Work will be solely the responsibility of the Employer performing the work involved; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") or any successor Plan.

Section 8.2 The Plan All jurisdictional disputes on this Project between or among the building and construction trades Unions and the Employers parties to this Agreement, shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department or any other plan or method of procedure that may be adopted in the future by the Building and Construction Trades Department. Decisions rendered shall be final, binding and conclusive on the Employers and Unions parties to this Agreement.

(a) If a dispute arising under this Article involves the Southwest Regional Council of Carpenters or any of its subordinate bodies, an Arbitrator shall be chosen by the procedures specified in Article V, Section 5, of the Plan from a list composed of John Kagel, Thomas Angelo, Robert Hirsch, and Thomas Pagan, and the Arbitrator's hearing on the dispute shall be held at the offices of the Trades Council within 14 days of the selection of the Arbitrator. All other procedures shall be as specified in the Plan.

Section 8.3 No Work Disruption Over Jurisdiction All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, or slow-down of any nature, and the Employer's assignment shall be adhered to until the dispute is resolved. Individuals violating this section shall be subject to immediate discharge.

Section 8.4 Pre-Job Conferences As provided in Article 16, each Contractor will conduct a pre-job conference with the appropriate affected Union(s) prior to commencing work. The Trades Council and the PLA Administrator shall be advised in advance of all such conferences and may participate if they wish.

Section 8.5 Resolution of Jurisdictional Disputes If any actual or threatened strike, sympathy strike, work stoppage, slow down, picketing, hand-billing or otherwise advising the public that a labor dispute exists, or interference with the progress of Project Work by reason of a jurisdictional dispute or disputes occurs, the Parties shall exhaust the expedited procedures set

forth in the Plan, if such procedures are in the plan then currently in effect, or otherwise as in Article 7 above.

ARTICLE 9
MANAGEMENT RIGHTS

Section 9.1 Contractor and City Rights The Contractors and the City have the sole and exclusive right and authority to oversee and manage construction operations on Project Work and expressly reserve their management rights and all rights conferred upon them by law without any limitations unless expressly limited or required by a specific provision of this Agreement or a Schedule A Agreement. These rights include, but are not limited to, the right to:

- (a) Plan, direct and control operations of all work;
- (b) Hire, promote, transfer and layoff their own employees, respectively, as deemed appropriate to satisfy work and/or skill requirements;
- (c) Promulgate and require all employees to observe reasonable job rules and security and safety regulations;
- (d) Discharge, suspend or discipline their own employees for just cause;
- (e) Utilize, in accordance with City approval, any work methods, procedures or techniques, and select, use and install any types or kinds of materials, apparatus or equipment, regardless of source of manufacture or construction; assign and schedule work at their discretion; and
- (f) Assign overtime, determine when it will be worked and the number and identity of employees engaged in such work, subject to such provisions in the applicable Schedule A(s) requiring such assignments be equalized or otherwise made in a nondiscriminatory manner.

Section 9.2 Specific City Rights In addition to the following and other rights of the City enumerated in this Agreement, the City expressly reserves its management rights and all the rights conferred on it by law. The City's rights (and those of the Contract Administrator on its behalf) include but are not limited to the right to:

- (a) Inspect any construction site or facility to ensure that the Contractor follows the applicable safety and other work requirements;
- (b) Require Contractors to establish a different work week or shift schedule for particular employees as required to meet the operational needs of the Project Work at a particular location;
- (c) At its sole option, terminate, delay and/or suspend any and all portions of the covered work at any time; prohibit some or all work on certain days or during certain hours of the day to accommodate the ongoing operations of the City's Facilities and/or to mitigate the

effect of ongoing Project Work on businesses and residents in the neighborhood of the Project site; and/or require such other operational or schedule changes it deems necessary, in its sole judgment, to effectively maintain its primary mission and remain a good neighbor to those in the area of its facilities. (In order to permit the Contractors and Unions to make appropriate scheduling plans, the City will provide the PLA Administrator, and the affected Contractor(s) and Union(s) with reasonable notice of any changes it requires pursuant to this section; provided, however, that if notice is not provided in time to advise employees not to report for work, show-up pay shall be due pursuant to the provision of Article 6, Section 6.6);

(d) Approve any work methods, procedures and techniques used by Contractors whether or not these methods, procedures or techniques are part of industry practices or customs; and

(e) Investigate and process complaints, through the PLA Administrator, in the matter set forth in Articles 7 and 10.

Section 9.3 Use of Materials There should be no limitations or restriction by Union upon a Contractor's choice of materials or design, nor, regardless of source or location, upon the full use and utilization, of equipment, machinery, packaging, precast, prefabricated, prefinished, or preassembled materials, tools or other labor saving devices, subject to the application of the State Public Contracts and Labor Codes as required by law in reference to offsite construction. Generally, the onsite installation or application of such items shall be performed by the craft having jurisdiction over such work. The City and the PLA Administrator shall advise all Contractors of, and enforce as appropriate, the off-site application of the prevailing wage law as it affects Project Work.

Section 9.4 Special Equipment, Warranties and Guaranties

(a) It is recognized that certain equipment of a highly technical and specialized nature may be installed at Project Work sites. The nature of the equipment, together with the requirements for manufacturer's warranties, may dictate that it be prefabricated pre-piped and/or pre-wired and that it be installed under the supervision and direction of the City's and/or manufacturer's personnel. The Unions agree to install such equipment without incident.

(b) The Parties recognize that the Contractor will initiate from time to time the use of new technology, equipment, machinery, tools, and other labor-savings devices and methods of performing Project Work. The Union agrees that they will not restrict the implementation of such devices or work methods. The Unions will accept and will not refuse to handle, install or work with any standardized and/or catalogue: parts, assemblies, accessories, prefabricated items, preassembled items, partially assembled items, or materials whatever their source of manufacture or construction.

(c) If any disagreement between the Contractor and the Unions concerning the methods of implementation or installation of any equipment, or device or item, or method of work, arises, or whether a particular part or pre-assembled item is a standardized or catalog part or item, the work will precede as directed by the Contractor and the Parties shall immediately

consult over the matter. If the disagreement is not resolved, the affected Union(s) shall have the right to proceed through the procedures set forth in Article 10.

ARTICLE 10
SETTLEMENT OF GRIEVANCES AND DISPUTES

Section 10.1 Cooperation and Harmony on Site

(a) This Agreement is intended to establish and foster continued close cooperation between management and labor. The Trades Council shall assign a representative to this Project for the purpose of assisting the local Unions, and working with the PLA Administrator, together with the Contractors, to complete the construction of the Project economically, efficiently, continuously and without any interruption, delays or work stoppages.

(b) The PLA Administrator, the Contractors, Unions, and employees collectively and individually, realize the importance to all Parties of maintaining continuous and uninterrupted performance Project Work, and agree to resolve disputes in accordance with the grievance provisions set forth in this Article or, as appropriate, those of Article 7 or 8.

(c) The PLA Administrator shall oversee the processing of grievances under this Article and Articles 7 and 8, including the scheduling and arrangements of facilities for meetings, selection of the arbitrator from the agreed-upon panel to hear the case, and any other administrative matters necessary to facilitate the timely resolution of any dispute; provided, however, it is the responsibility of the principal parties to any pending grievance to insure the time limits and deadlines are met.

Section 10.2 Processing Grievances Any questions arising out of and during the term of this Agreement involving its interpretation and application, which includes applicable provisions of the Schedule A's, but not jurisdictional disputes or alleged violations of Section 7.1 and 7.4 herein and similar provisions, shall be considered a grievance and subject to resolution under the following procedures.

Step 1. Employee Grievances When any employee subject to the provisions of this Agreement feels aggrieved by an alleged violation of this Agreement, the employee shall, through his local Union business representative or, job steward, within ten (10) working days after the occurrence of the violation, give notice to the work site representative of the involved Contractor stating the provision(s) alleged to have been violated. A business representative of the local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to resolve the matter within ten (10) working days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party may, within ten (10) working days thereafter, pursue Step 2 of this grievance procedure provided the grievance is reduced to writing, setting forth the relevant information, including a short description thereof, the date on which the alleged violation occurred, and the provision(s) of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 shall be non-precedential except as to the parties directly involved.

Union or Contractor Grievances Should the Union(s) or any Contractor have a dispute with the other Party(ies) and, if after conferring within ten (10) working days after the disputing Party knew or should have known of the facts or occurrence giving rise to the dispute, a settlement is not reached within five (5) working days, the dispute shall be reduced to writing and processed to Step 2 in the same manner as outlined in Step 1 above for the adjustment of an employee complaint.

Step 2. The business manager of the involved local Union or his designee, together with the site representative of the involved Contractor, and the labor relations representative of the PLA Administrator, shall meet within seven (7) working days of the referral of the dispute to this second step to arrive at a satisfactory settlement thereof. If the Parties fail to reach an agreement, the dispute may be appealed in writing in accordance with the provisions of Step 3 within seven (7) calendar days after the initial meeting at Step 2.

Step 3. (a) If the grievance shall have been submitted but not resolved under Step 2, either the Union or Contractor Party may request in writing to the PLA Administrator (with copy (ies) to the other Party (ies)) within seven (7) calendar days after the initial Step 2 meeting, that the grievance be submitted to an arbitrator selected from the agreed upon list in “**Attachment D**” attached hereto, on a rotational basis in the order listed. The decision of the arbitrator shall be final and binding on all Parties and the fee and expenses of such arbitrations shall be borne equally by the involved Contractor(s) and the involved Union(s).

(b) Failure of the grieving Party to adhere to the time limits established herein shall render the grievance null and void. The time limits established herein may be extended only by written consent of the Parties involved at the particular step where the extension is agreed upon. The arbitrator shall have the authority to make decisions only on issues presented and shall not have the authority to change, amend, add to or detract from any of the provisions of this Agreement.

(c) The fees and expenses incurred by the arbitrator, as well as those jointly utilized by the Parties (i.e., conference room, court reporter, etc.) in arbitration, shall be divided equally by the Parties to the arbitration, including Union(s) and Contractor(s) involved.

Section 10.3 Limit on Use of Procedures The procedures contained in this Article shall not be applicable to any alleged violation of Articles 7 or 8, with a single exception that any employee discharged for violation of Section 7.2, or Section 8.3, may resort to the procedures of this Article to determine only if he/she was, in fact, engaged in that violation.

Section 10.4 Notice The PLA Administrator (and the City, in the case of any grievance regarding the Scope of this Agreement), shall be notified by the involved Contractor of all actions at Steps 2 and 3, and further, the PLA Administrator shall, upon its own request, be permitted to participate fully as a party in all proceedings at such steps.

ARTICLE 11
REGULATORY COMPLIANCE

Section 11.1 Compliance with All Laws The Trades Council and all Unions, Contractors, subcontractors and their employees shall comply with all applicable federal and state laws, ordinances and regulations including, but not limited to, those relating to safety and health, employment and applications for employment. All employees shall comply with the safety regulations established by the City, the PLA Administrator or the Contractor. Employees must promptly report any injuries or accidents to a supervisor.

Section 11.2 Prevailing Wage Compliance All Contractors shall comply with the state laws and regulation on prevailing wages. Compliance with this obligation may be enforced by the appropriate parties through Article 10 above, or by pursuing the remedies available under state law through the Labor Commissioner or the Department of Industrial Relations.

Section 11.3 Violations of Law Should there be a finding by a Court or administrative tribunal of competent jurisdiction that a Contractor has violated federal and/or state law or regulation, the City, upon notice to the Contractor that it or its subcontractors is in such violation (including any finding of non-compliance with the California prevailing wage obligations as enforced pursuant to DIR regulations), the City, and in the absence of the Contractor or subcontractor remedying such violation, may take such action as it is permitted by law or contract to encourage that Contractor to come into compliance, including, but not limited to, assessing fines and penalties and/or removing the offending Contractor from Project Work.

ARTICLE 12
SAFETY AND PROTECTION OF PERSON AND PROPERTY

Section 12.1 Safety

(a) It shall be the responsibility of each Contractor to ensure safe working conditions and employee compliance with any safety rules contained herein or established by the City or the Contractor, whichever is most restrictive shall apply. It is understood that employees have an individual obligation to use diligent care to perform their work in a safe manner and to protect themselves and the property of the Contractor and the City.

(b) Employees shall be bound by the safety, security and visitor rules established by the Contractor and/or the City. These rules will be published and posted. An employee's failure to satisfy his/her obligations under this section will subject him/her to discipline, up to and including discharge.

(c) The Contractor shall comply with all of the requirements of the Pipeline and Hazardous Materials Safety Administration Drug and Alcohol Testing Regulations, 49 CFR Part 199, for pipeline operators, the Federal Highway Administration Drug and Alcohol Testing Regulations, 49 CFR Part 382, for drivers of commercial motor vehicles and the Procedures for Transportation Workplace Drug and Alcohol Testing Programs, 49 CFR Part 40. It is the responsibility of the Contractor to be familiar with the requirements of these regulations.

(d) Prior to the start of work, the Contractor shall provide adequate documentation to substantiate full compliance with these regulations. This documentation shall include, but not be limited to; a current copy of the Contractor's written Drug and Alcohol testing policy indicating:

1. Type of tests (pre-employment, preventative, post-accident, etc.) and details of the testing procedures employed;
2. Name of the Medical Review Officer and Substance Abuse Professional and an outline of their responsibilities;
3. Name of the testing laboratory and proof of National Institute on Drug Abuse (N.I.D.A.) certification by the U.S. Department of Health and Human Services; and Collection agency name.

The City, in its sole discretion, will determine whether the policy submitted is compliant with the applicable regulations. The City reserves the right to reject any contractor or subcontractor that does not meet the above applicable Drug and Alcohol Testing Program regulations.

Ten (10) days prior to start of construction, the Contractor shall submit to the applicable City Project Engineer a copy of the summary of results of the previous 3 month's drugs tests. This summary should include only the total number of persons tested each month and the number of positive and negative test results for each month. The names of those persons tested shall not be included in the summary report. The City reserves the right, in accordance with the provisions of 49 CRF Part 199, to inspect the Contractor's program records, upon request.

Section 12.2 Suspension of Work for Safety A Contractor may suspend all or a portion of the job to protect the life and safety of employees. In such cases, employees will be compensated only for the actual time worked; provided, however, that where the Contractor requests employees to remain at the site and be available for work, the employees will be compensated for stand-by time at their basic hourly rate of pay.

Section 12.3 Water and Sanitary Facilities The Contractor shall provide adequate supplies of drinking water and sanitary facilities for all employees as required by state law or regulation.

ARTICLE 13 TRAVEL AND SUBSISTENCE

Travel expenses, travel time, subsistence allowances, zone rates and parking reimbursements shall be paid in accordance with the applicable Schedule A Agreement unless superseded by the applicable prevailing wage determination.

ARTICLE 14 APPRENTICES

Section 14.1 Importance of Training The Parties recognize the need to maintain continuing support of the programs designed to develop adequate numbers of competent workers

in the construction industry, the obligation to capitalize on the availability of the local work force in the area served by the City, and the opportunities to provide continuing work under the construction program. To these ends, the Parties will facilitate, encourage, and assist local residents to commence and progress in Labor/Management Apprenticeship and/or training Programs in the construction industry leading to participation in such apprenticeship programs. The City and the Trades Council will work cooperatively to identify, or establish and maintain, effective programs and procedures for persons interested in entering the construction industry and which will help prepare them for the formal joint labor/management apprenticeship programs maintained by the signatory Unions.

Section 14.2 Use of Apprentices

(a) Apprentices used on Projects under this Agreement shall be registered in Joint Labor Management Apprenticeship Programs approved by the State of California. Apprentices may comprise up to thirty percent (30%) of each craft's work force (calculated by hours worked) at any time, unless the standards of the applicable joint apprenticeship committee confirmed by the Division of Apprenticeship Standards ("DAS"), establish a lower or higher maximum percentage. Where the standards permit a higher percentage, such percentage shall apply on Project Work. Where the applicable standards establish a lower percentage, the applicable Union will use its best efforts with the Joint Labor Management apprenticeship committee and, if necessary, the DAS to permit up to thirty percent (30%) apprentices on the Project.

(b) The Unions agree to cooperate with the Contractor in furnishing apprentices as requested up to the maximum percentage. The apprentice ratio for each craft shall be in compliance, at a minimum, with the applicable provisions of the Labor Code relating to utilization of apprentices. The City shall encourage such utilization, and, both as to apprentices and the overall supply of experienced workers, the PLA Administrator will work with the Trades Council to assure appropriate and maximum utilization of apprentices and the continuing availability of both apprentices and journey persons.

(c) The Parties agree that apprentices will not be dispatched to Contractors working under this Agreement unless there is a journeyman working on the project where the apprentice is to be employed who is qualified to assist and oversee the apprentice's progress through the program in which he is participating.

(d) All apprentices shall work under the direct supervision of a journeyman from the trade in which the apprentice is indentured. A journeyman shall be defined as set forth in the California Code of Regulations, Title 8 [apprenticeship] section 205, which defines a journeyman as a person who has either completed an accredited apprenticeship in his or her craft, or has completed the equivalent of an apprenticeship in length and content of work experience and all other requirements in the craft which has workers classified as journeyman in the apprenticeable occupation. Should a question arise as to a journeyman's qualification under this subsection, the Contractor shall provide adequate proof evidencing the worker's qualification as a journeyman to the Trades Council.

Section 14.3 Joint Subcommittee on Training and Apprenticeship To carry out the intent and purposes of this Article, a subcommittee of the Labor Management Committee established pursuant to Article 17 may be established, jointly chaired by a designee of the City and a designee of the Trades Council, to oversee the identification and/or effective development of procedures and programs leading to the full utilization of apprenticeship programs, and to work with representatives of each signatory craft's joint apprenticeship committee ("CJAC") and representatives of the City's technical schools to establish appropriate criteria for recognition by such CJAC's of the educational and work experience possessed by City students and graduates toward qualifying for entry or advanced level in the apprenticeship programs under the direction under such CJAC's. The Subcommittee will meet as necessary at the call of the joint chairs to promptly facilitate its purposes in an expeditious manner as soon as this Agreement becomes effective. In addition to the joint chairs, the membership of the committee will consist of at least three representatives of the signatory local Unions and three representatives of Contractors signatory to this Agreement and experienced in overseeing and participating in joint labor management apprenticeship programs (or organizations to which the Contractors belong).

ARTICLE 15 WORKING CONDITIONS

Section 15.1 Meal and Rest Periods There will be no non-working times established during working hours except as may be required by applicable state law or regulations. Meal periods and Rest periods shall be as provided for in Wage Order 16. Individual coffee containers will be permitted at the employees' work location; however, there will be no organized coffee breaks.

Section 15.2 Work Rules The City, the PLA Administrator, and/or relevant Contractor shall establish such reasonable work rules as they deem appropriate and not inconsistent with this Agreement. These rules will be posted at the work sites by the Contractor and may be amended thereafter as necessary. Failure to observe these rules and regulations by employees may be grounds for discipline up to and including discharge.

Section 15.3 Emergency Use of Tools and Equipment There should be no restrictions on the emergency use of any tools by any qualified employee or supervisor, or on the use of any tools or equipment for the performance of work within the jurisdiction, provided the employee can safely use the tools and/or equipment involved and is compliance with applicable governmental rules and regulations.

Section 15.4 Access Restrictions for Cars Recognizing the nature of the work being conducted on the site, employee access by a private automobile may be limited to certain roads and/or parking areas.

ARTICLE 16 PRE-JOB CONFERENCES

Section 16.1 Each Primary Contractor which is awarded a Construction Contract by the City for Project Work shall conduct a Pre-Job conference with the appropriate affected Union(s) prior to commencing work. All Contractors who have been awarded contracts by the Primary

Contractor shall attend the Pre-Job conference. The Trades Council and the PLA Administrator shall be advised in advance of all such conferences and may participate if they wish. All work assignments shall be disclosed by the Primary Contractor and all Contractors at the Pre-Job conference in accordance with industry practice. Should there be any formal jurisdictional dispute raised under Article 8, the PLA Administrator shall be promptly notified. Primary Contractor shall have available at the Pre-Job conference the plans and drawing for the work to be performed on the Project.

ARTICLE 17 LABOR/MANAGEMENT COOPERATION

Section 17.1 Joint Committee The Parties to this Agreement shall establish a six (6) person Joint Administrative Committee (JAC). This JAC shall be comprised of three (3) representatives selected by the City and three (3) representatives selected by the Trades Council to monitor compliance with the terms and conditions of this Agreement and to recommend amendments to this Agreement, with the exception of the dollar threshold specified in Section 2.2(a) and the term of this Agreement under Section 22.1, when doing so would be to the mutual benefit of the Parties. Each representative shall designate an alternate who shall serve in his or her absence for any purpose contemplated by this Agreement. A quorum will consist of at least two (2) representatives selected by the City and at least two (2) representatives selected by the Trades Council. For voting purposes, only an equal number of City and Union representatives present may constitute a voting quorum.

Section 17.2 Functions of Joint Committee The Committee shall meet on a schedule to be determined by the Committee or at the call of the joint chairs, to discuss the administration of the Agreement, the progress of the Project, general labor management problems that may arise, and any other matters consistent with this Agreement. Substantive grievances or disputes arising under Articles 7, 8 or 10 shall not be reviewed or discussed by this Committee, but shall be processed pursuant to the provisions of the appropriate Article. The PLA Administrator shall be responsible for the scheduling of the meetings, the preparation of the agenda topics for the meetings, with input from the Unions the Contractors and the City. Notice of the date, time and place of meetings, shall be given to the Committee members at least three (3) days prior to the meeting. The PLA Administrator shall prepare quarterly reports on apprentice utilization and the training and employment of City residents, and a schedule of Project Work and estimated number of craft workers needed. The Committee or an appropriate subcommittee, may review such reports and make any recommendations for improvement, if necessary, including increasing the availability of skilled trades, and the employment of local residents or other individuals who should be assisted with appropriate training to qualify for apprenticeship programs.

Section 17.3 Subcommittees The Committee may form subcommittees to consider and advise the full Committee with regard to safety and health issues affecting the Project and other similar issues affecting the overall Project, including any workers compensation program initiated under this Agreement.

ARTICLE 18
SAVINGS AND SEPARABILITY

Section 18.1 Savings Clause It is not the intention of the City, the PLA Administrator, Contractor or the Union parties to violate any laws governing the subject matter of this Agreement. The Parties hereto agree that in the event any provision of this Agreement is finally held or determined to be illegal or void as being in contravention of any applicable law or regulation, the remainder of the Agreement shall remain in full force and effect unless the part or parts so found to be void are wholly inseparable from the remaining portions of this Agreement. Further, the Parties agree that if and when any provision(s) of this Agreement is finally held or determined to be illegal or void by a court of competent jurisdiction, the Parties will promptly enter into negotiations concerning the substantive effect of such decision for the purposes of achieving conformity with the requirements of any applicable laws and the intent of the Parties hereto. If the legality of this Agreement is challenged and any form of injunctive relief is granted by any court, suspending temporarily or permanently the implementation of this Agreement, then the Parties agree that all Project Work that would otherwise be covered by this Agreement should be continued to be bid and constructed without application of this Agreement so that there is no delay or interference with the ongoing planning, bidding and construction of any Project Work.

Section 18.2 Effect of Injunctions or Other Court Orders The Parties recognize the right of the City to withdraw, at its absolute discretion, the utilization of the Agreement as part of any bid specification should a Court of competent jurisdiction issue any order, or any applicable statute which could result, temporarily or permanently in delay of the bidding, awarding and/or construction on the Project. Notwithstanding such an action by the City, or such court order or statutory provision, the Parties agree that the Agreement shall remain in full force and the fact on covered Project Work to the maximum extent legally possible.

ARTICLE 19
WAIVER

A waiver of or a failure to assert any provisions of this Agreement by any or all of the Parties hereto shall not constitute a waiver of such provision for the future. Any such waiver shall not constitute a modification of the Agreement or change in the terms and conditions of the Agreement and shall not relieve, excuse or release any of the Parties from any of their rights, duties or obligations hereunder.

ARTICLE 20
AMENDMENTS AND AMBIGUITY

The provisions of this Agreement can be renegotiated, supplemented, rescinded or otherwise altered only by mutual agreement in writing, hereafter signed by the negotiating Parties hereto. In the event of any conflict or ambiguity between this Agreement and any Attachment or exhibit, the provisions of this Agreement shall govern.

ARTICLE 21
WORK OPPORTUNITIES PROGRAM

Section 21.1 Work Opportunities The Parties to this Agreement support the development of increased numbers of skilled construction workers from among the Area Residents residing within the City of Long Beach (“Area Residents”), to meet the labor needs of the Project, specifically, and the requirements of the local construction industry generally. Towards that end the Parties agree to cooperate respecting the establishment of a work opportunities program for these Area Residents, the primary goals of which shall be to maximize construction work opportunities for traditionally underrepresented members of the community. In furtherance of the foregoing, the Unions specifically agree to:

(a) Encourage the referral and utilization, to the extent permitted by law and hiring hall practices, of qualified Area Residents as journeymen, and apprentices on the Project and entrance into such qualified apprenticeship and training programs as may be operated by signatory Unions; and

(b) Assist Area Residents in contacting pre-apprenticeship programs that utilize the Building Trades multi-craft core curriculum (MC3) including Long Beach City College’s MC3 Pre-Apprenticeship Program and the Apprenticeship Training Committees for the crafts and trades they are interested in. The Unions shall assist Area Residents who are seeking Union jobs on the Project and Union membership in assessing their work experience and giving them credit for provable past experience in their relevant craft or trade, including experience gained working for non-union Contractors. The Unions shall put on their rolls qualified bona fide Area Residents for work on this Project; and

(c) Support local events and programs designed to recruit and develop adequate numbers of qualified workers in the construction industry.

(d) Allow tours of their JAC training facilities, as requested; and

(e) Provide a contact information list for all Union representatives and Joint Apprenticeship Committee representatives; and

ARTICLE 22
DURATION OF THE AGREEMENT

Section 22.1 Duration

(a) This Agreement shall be effective from the date signed by all Parties and shall remain in effect for a period of ten (10) years. Any covered Project awarded during the term of this Agreement shall continue to be covered hereunder, until completion of the Project, notwithstanding the expiration date of this Agreement.

(b) This Agreement may be extended by written mutual consent of the City and the signatory Unions for such further periods as the Parties shall agree to.

Section 22.2 Turnover and Final Acceptance of Completed Work

(a) Construction of any phase, portion, section, or segment of Project Work shall be deemed complete when such phase, portion, section or segment has been turned over to the City by the Contractor and the City has accepted such phase, portion, section, or segment. As areas and systems of the Project are inspected and construction-tested and/or approved and accepted by the City or third parties with the approval of the City, the Agreement shall have no further force or effect on such items or areas, except when the Contractor is directed by the City to engage and repairs or modifications required by its contract(s) with the City.

(b) Notice of each final acceptance received by the Contractor will be provided to the Trades Council with the description of what portion, segment, etc. has been accepted. Final acceptance may be subject to a "punch" list, and in such case, the Agreement will continue to apply to each such item on the list until it is completed to the satisfaction of the City and Notice of Completion is issued by the City or its representative to the Contractor. At the request of the Union, complete information describing any "punch" list work, as well as any additional work required of a Contractor at the direction of the City pursuant to (a) above, involving otherwise turned-over and completed facilities which have been accepted by the City, will be available from the PLA Administrator.

IN WITNESS whereof the Parties have caused this Project Labor Agreement to be executed as of the date and year above stated.

CITY OF LONG BEACH

LOS ANGELES/ORANGE COUNTIES
BUILDING & CONSTRUCTION
TRADES COUNCIL

By: Linda F. Jatum
Thomas B. Modica 5/6/2021
City Manager

By: Ron Miller
Ron Miller
Executive Secretary

EXECUTED PURSUANT
TO SECTION 301 OF
THE CITY CHARTER

APPROVED AS TO FORM
April 29, 2021
CHARLES PARKIN, City Attorney

By: Erin Weesner-Mckinley
ERIN WEESNER-MCKINLEY
DEPUTY CITY ATTORNEY

LOS ANGELES/ORANGE COUNTIES BUILDING AND CONSTRUCTION
TRADES COUNCIL CRAFT UNIONS AND DISTRICT COUNCILS

Asbestos Heat & Frost Insulators (Local 5)

Boilermakers (Local 92)

Bricklayers & Allied Craftworkers (Local 4)

Cement Masons (Local 500)

Electricians (Local 11)

Elevator Constructors (Local 18)

Gunite Workers (Local 345)

Iron Workers (Reinforced – Local 416)

Iron Workers (Structural – Local 433)

Laborers (Local 1184)

Laborers (Local 1309)

Laborers (Local 300) (Remediation)

Operating Engineers (Local 12)

Operating Engineers (Local 12)

Operating Engineers (Local 12)

Painters & Allied Trades DC 36

Pipe Trades (Local 250)

Pipe Trades (Local 345)

Pipe Trades (Plumbers Local 78)

Pipe Trades (Sprinkler Fitters Local 709)

Plasterers (Local 200)

Plaster Tenders (Local 1414)

Roofers & Waterproofers (Local 36)

Sheet Metal Workers (Local 105)

Teamsters (Local 986)

Southwest Regional Council of Carpenters

DocuSigned by:
Mike Patterson (Heat & Frost #5)

DocuSigned by:
Luis Miramontes (Boilermakers #92)

DocuSigned by:
Lupo Aldaco (Bl(#4)

DocuSigned by:
Jack Alvarado

DocuSigned by:
Joel Barton (IBEW #11)

DocuSigned by:
Tony Garganiga (Elevator Constructors #18)

DocuSigned by:
Ed Lamm (Gunite #345)

DocuSigned by:
Vidal Zambrano (Iron Workers #416)

DocuSigned by:
Keith Harker - Local 433 Ironworkers

DocuSigned by:
Michael Dea (LIUNA #1184)

DocuSigned by:
Mario Swales (LIUNA Local 1309)

DocuSigned by:
Sergio Rascon (LIUNA #300)

DocuSigned by:
Ron Sikorski (Operating Engineers #12)

DocuSigned by:
David Sikorski

DocuSigned by:
Larry Davison

DocuSigned by:
Mark Bartlett

DocuSigned by:
Glenn Santa Cruz (UL#250)

DocuSigned by:
Ricardo Perez (UL#345)

DocuSigned by:
Jeremy Diaz (Plumbers #78)

DocuSigned by:
Todd Gaden (Sprinkler Fitters #709)

DocuSigned by:
Tom Castleman (Plasterers #200)

DocuSigned by:
Jim Preciado (Plaster Tenders #1414)

DocuSigned by:
Cliff Smith (Roofers #36)

DocuSigned by:
Luther Medina

DocuSigned by:
Caesar Bogas (Teamsters #986)

DocuSigned by:
Stephen Ariza

ATTACHMENT A

LETTER OF ASSENT

To be signed by all contractors awarded work covered by the City of Long Beach Project Labor Agreement prior to commencing work.

[Contractor's Letterhead]
PLA Administrator
City of Long Beach
1234 address
City, state, zip code
Attn: _____

Re: Project Labor Agreement - Letter of Assent

Dear Sir:

This is to confirm that [name of company] agrees to be party to and bound by the City of Long Beach Project Labor Agreement effective_____, 2021, as such Agreement may, from time to time, be amended by the negotiating parties or interpreted pursuant to its terms. Such obligation to be a party and bound by this Agreement shall extend to all work covered by the agreement undertaken by this Company on the project and this Company shall require all of its contractors and subcontractors of whatever tier to be similarly bound for all work within the scope of the Agreement by signing and furnishing to you an identical letter of assent prior to their commencement of work.

Sincerely,

[Name of Construction Company]

By: [_____] Name and Title of Authorized Executive

Contractor's State License No.: _____

Project Name: _____

[Copies of this letter must be submitted to the PLA Administrator and to the Trades Council Consistent with Article 2, Section 2.6 (b).]

ATTACHMENT B

FIRST TIER ZIP CODES (CITY BOUNDARY)

90802	Long Beach
90803	Long Beach
90804	Long Beach
90805	Long Beach
90806	Long Beach
90807	Long Beach
90808	Long Beach
90809	Long Beach
90810	Long Beach
90813	Long Beach
90814	Long Beach
90815	Long Beach
90822	Long Beach

SECOND TIER ZIP CODES (GATEWAY CITIES)

90001	Florence/South Central	90605	Whittier/South Whittier
90022	East Los Angeles	90606	Whittier
90023	East Los Angels	90638	La Mirada
90040	Commerce	90639	La Mirada
90058	Vernon	90640	Montebello
90201	Bell/Bell Gardens/Cudahy	90650	Norwalk
90220	Compton/Rancho Dominguez	90660	Pico Rivera
90221	Compton/East Rancho Dominguez	90670	Santa Fe Springs
90222	Compton/Rosewood/Willowbrook	90701	Artesia/Cerritos
90240	Downey	90703	Cerritos
90241	Downey	90704	Avalon
90242	Downey	90706	Bellflower
90262	Lynwood	90712	Lakewood
90270	Maywood	90713	Lakewood
90280	South Gate	90715	Lakewood
90601	Whittier	90716	Hawaiian Gardens
90602	Whittier	90723	Paramount
90603	Whittier	90755	Signal Hill
90604	Whittier	91744	Industry

THIRD TIER

(LOS ANGELES AND ORANGE COUNTY RESIDENTS)

ATTACHMENT C

**CITY OF LONG BEACH
CRAFT REQUEST FORM**

TO THE CONTRACTOR: Please complete and fax this form to the applicable union to request craft workers that fulfill the hiring requirements for this project. After faxing your request, please call the Local to verify receipt and substantiate their capacity to furnish workers as specified below. Please print your Fax Transmission Verification Reports and keep copies for your records.

The City of Long Beach Project Labor Agreement establishes a goal that 40% of the total work hours shall be from workers residing: first, in those first tier zip codes which include all of the City of Long Beach, as attached hereto, second, in those second tier zip codes which reflect the Gateway Cities, as attached hereto, and third, residing within the Counties of Orange and Los Angeles. Where Project Work is funded in full or in part by State of California Tideland funds, the term Local Resident, as used herein, shall mean an individual whose primary place of residence is within the Counties of Los Angeles or Orange. For Dispatch purposes, employees residing within any of these three (3) areas shall be referred to as Local Residents.

The PLA establishes a further goal that 10% of the total work hours shall be from transitional workers and veterans. "Transitional Workers" means an individual whose income as an unrelated individual or whose family income is below seventy percent (70%) of the Lower Living Standard Income Level as determined and published by the United States Department of Labor applicable to the area in which the individual resides, and as verified by the Pacific Gateway Workforce Investment Network.

TO THE UNION: Please complete the "Union Use Only" section on the next page and fax this form back to the requesting Contractor. Be sure to retain a copy of this form for your records.

CONTRACTOR USE ONLY

To: Union Local # _____ **Fax#** () _____ **Date:** _____

Cc: PLA Administrator

From: Company: _____ **Issued By:** _____

Contact Phone : () _____ **Contact Fax:** () _____

PLEASE PROVIDE ME WITH THE FOLLOWING UNION CRAFT WORKERS.

Craft Classification (i.e., plumber, painter, etc.)	Journeyman or Apprentice	Local Resident, Transitional Workers, Veteran, or General Dispatch	Number of workers needed	Report Date	Report Time
TOTAL WORKERS REQUESTED = _____					

Please have worker(s) report to the following work address indicated below:

Project Name: _____ Site: _____ Address: _____

Report to: _____ On-site Tel: _____ On-site Fax: _____

Comment or Special Instructions: _____

UNION USE ONLY

Date dispatch request received:
Dispatch received by:
Classification of worker requested:
Classification of worker dispatched:

WORKER REFERRED

Name:
Date worker was dispatched:
Is the worker referred a: (check all that apply)

JOURNEYMAN	Yes _____	No _____
APPRENTICE	Yes _____	No _____
LOCAL RESIDENT	Yes _____	No _____
TRANSITIONAL WORKERS OR VETERAN	Yes _____	No _____
GENERAL DISPATCH FROM OUT OF WORK LIST	Yes _____	No _____

ATTACHEMENT D - ARBITRATORS

- (1) Edna Francis
- (2) Louis Zigman
- (3) Fredric Horowitz
- (4) Sara Adler
- (5) Michael Prihar
- (6) Walt Daugherty
- (7) Michael Rappaport

Equal Benefits Ordinance:

Bidders are advised that any contract awarded pursuant to this procurement process shall be subject to the applicable provisions of Long Beach Municipal Code Section 2.73 et seq., the Equal Benefits Ordinance. Bidders shall refer to Division C for further information regarding the requirements of the Ordinance.

All Bidders shall complete and return, with their bid, the Equal Benefits Ordinance Compliance form contained in Division C. Unless otherwise specified in this procurement package, Bidders do not need to submit supporting documentation with their bids. However, supporting documentation verifying that the benefits are provided equally shall be required if the Bidder is selected for award of a contract.

WEB BASED PROJECT MANAGEMENT SYSTEM

- A. The City will implement and utilize a web-based project management system for the duration of this project. The web-based system will be Orion Construction Management Software (OCMS) or similar and shall be utilized by the CONTRACTOR for the submission of all data and documents for the duration of the Contract. Access and instructions will be provided by the City. The OCMS will be made available to the CONTRACTOR's Project Manager(s), CONTRACTOR's Superintendent, Subcontractor Project Managers, ENGINEER's Consultants and DESIGN ENGINEER. The use of this system is to facilitate electronic exchange of information, automation of key processes, and overall management of the Contract. The OCMS shall be the primary means of project information submission and management. The City will not respond to information that is submitted in any other manner when required to be submitted through the system. Paper documents shall only be submitted where required. If the event of a conflict between the paper documents and the electronic version, the paper documents will govern.
- B. The City may deduct the actual cost of managing and archiving correspondence, or any other project related documentation, transmitted outside of the OCMS (i.e. email). Costs will be tracked on a time and materials basis and be deducted from monthly progress payments owed to the CONTRACTOR in the month the costs were incurred.
- C. **USER ACCESS LIMITATIONS:** The City and their representatives will control the CONTRACTOR's access to OCMS by allowing access and assigning user profiles to accepted CONTRACTOR personnel. User profiles will define levels of access into the system; determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do). Subcontractors and suppliers will be provided access to OCMS through the CONTRACTOR. Entry of information exchanged and transferred between the CONTRACTOR and its subcontractors and suppliers on OCMS shall be the responsibility of the CONTRACTOR.
- D. **COMPUTER REQUIREMENTS:** The CONTRACTOR shall use computer hardware and software that meets the requirements of the OCMS system as recommended by Bentley Systems to access and utilize OCMS. As recommendations are modified by OCMS, the CONTRACTOR will upgrade their system(s) to meet or exceed the recommendations. Upgrading of CONTRACTOR's computer systems will not be justification for a cost or time modification to the Contract. The CONTRACTOR will ensure that connectivity to the OCMS system (whether at the home office or job site) is accomplished through DSL, cable, T-1 or wireless communications systems. The minimum bandwidth requirement for using the system is 128kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. OCMS currently supports Mozilla's Firefox, Apple's Safari, Google's Chrome, and Microsoft's Internet Explorer web browsers for accessing the application.
- E. **CONTRACTOR RESPONSIBILITY**
 1. The CONTRACTOR shall be responsible for the validity of their information placed in OCMS and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, CAD drawing applications, and Adobe Portable Document Format (PDF) document distribution program. The CONTRACTOR shall utilize the existing forms in OCMS to the maximum extent possible. If a form does not exist in OCMS the

CONTRACTOR must include a form of their own or provided by the City representative as an attachment to a submittal. Adobe PDF documents shall be created through electronic conversion rather than optically scanned whenever possible. The CONTRACTOR is responsible for the training of their personnel in the use of OCMS (outside what is provided by the City) and the other programs indicated above as needed.

2. Provide a list of CONTRACTOR's key OCMS personnel for the City's representative acceptance. CONTRACTOR is responsible for adding and removing users from the system. The City's representative may perform a security check on all potential users. The CONTRACTOR will be allowed to add additional personnel and subcontractors to OCMS.
- F. **CONNECTIVITY PROBLEMS:** The CONTRACTOR is responsible for its own connectivity to the Internet. OCMS response time is dependent on the CONTRACTOR's equipment, including processor speed, Internet access speed, etc. and current traffic on the Internet. The City will not be liable for any delays associated from the usage of OCMS including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. Under no circumstances shall the usage of the OCMS be grounds for a time extension or cost adjustment to the Contract.
- G. **TRAINING:** The City will arrange for up to three (3) 4-hour training sessions on the OCMS system to be provided to the CONTRACTOR. The days and times of the training will be coordinated with the CONTRACTOR following execution of the Contract.
- H. Payment for use of the OCMS system shall be considered incidental to the work and included in other bid items in the Bid Form. No additional payment shall be made.

CONSTRUCTION AND DEMOLITION ORDINANCE REQUIREMENTS

CITY WILL PAY ADMINISTRATION FEE. CONTRACTOR RESPONSIBLE FOR DEPOSIT FEE AND COMPLETION OF THE FORMS.

FOR MORE INFORMATION VIEW THE WEBSITE AT:
<https://www.longbeach.gov/lbds/building/cd/>



INFORMATION BULLETIN

IB-033

Eff: 11-05-2007 Rev: 07-13-2021

Construction and Demolition Management Plan Information and Instruction Sheet

Why is there a recycling ordinance?

The State of California through its California Green Building Standards Code and as part of the City's commitment to sustainable development requires that certain construction and/or demolition projects divert at least 65% of waste through recycling, salvage, or deconstruction.

Refundable Performance Deposit

The Construction and Demolition Debris Recycling (C&D) Program, which took effect on November 5, 2007, encourages permit applicants to recycle 65% of all C&D materials. To assure uniform compliance with this program, a refundable performance deposit (aka C&D Deposit) will be required.

1. Applicants are required to submit a refundable Performance Deposit of either 3% of the project value or \$53,425 whichever is less. The minimum deposit is \$1,605 per project.
2. Applicants are also required to pay a non-refundable administrative review fee of either \$210.00 for residential projects or \$415.00 for commercial/industrial projects.

The Construction & Demolition Management Plan (CDMP)

The CDMP is designed to assist in estimating and determining the amount of construction and/or demolition debris diverted or disposed during the life of a construction project.

1. Diversion Rate Estimators

The Department has created an automated estimator that will calculate, by the type of construction, the amount of estimated waste that must be diverted. By entering the project/remodeled/altered size under the appropriate type of construction, the amount of construction and/or demolition debris that could potentially be generated from a construction project will be automatically estimated. The completed CDMP will be given to the permittee at permit issuance.

2. Final Compliance Report

Within 30 days after receipt of Certificate of Occupancy, final inspection, or the completion of demolition, the Final Compliance Report must be signed and submitted with the following information:

- a. Proof that C&D materials were taken to a certified diversion facility that processes and recycles mixed debris. See our City website for links to the nearest facility:
longbeach.gov/lbds/building/cd/
- b. Recycling receipts indicating: **Origin of recycled material, tonnage or quantity recycled/diverted and material type(s).**
- c. The waste facilities must be told that the receipts "Shall indicate that the material is being recycled".

Submit the Final Compliance Report and the appropriate recycling receipts by email at: construct-demo@longbeach.gov or in person at the Development Permit Center located at Long Beach City Hall, 411 W. Ocean Blvd., 2nd Floor. **IMPORTANT:** The City will not accept receipts that indicate “REFUSE, WASTE OR TRASH” Material(s) must be recycled. In addition, hauler’s receipts will not be accepted.

3. Verification

Once documentation is received, and the Compliance Official has reviewed and verified diversion requirements have been met, a check will be issued to the person/organization stated in the CDMP (Item I) based on the following criteria:

- a. If full compliance is met (65% of waste material associated with this project diverted with no more than 20% from recycling or reuse of inert materials, such as asphalt, brick, concrete and ceramics) a full release of the waste diversion deposit will be approved.
- b. If partial compliance is determined, (established as a percentage less than 65% of diverted waste materials) a partial return of the C&D deposit will be released in proportion to the actual materials diverted.
- c. If all required documentation is not received within the prescribed 30 days after final inspection or if it is determined that diversion of waste was not achieved, the waste diversion deposit shall be forfeited.

4. Exemptions

Exemptions for noncompliance with the recycling weights may be granted based on the following considerations:

- a. An emergency situation exists.
- b. Contamination by hazardous substances.
- c. Low recyclability of specific materials (i.e., roofing materials).
- d. All exemptions must be applied for in writing and submitted with the Final Compliance Report.

5. Appeals

The owner or authorized agent of the owner may appeal a decision rendered by the Compliance Officer relating to determination of a partial or total forfeiture of the waste diversion deposit. Notice of any appeal must be filed within ten (10) calendar days from the date that such ruling is made. A Hearing Officer designated by the Department of Development Services shall review the appeal. The decision of the Hearing Officer upon such appeal, relative to any matter within the jurisdiction of the Compliance Official, shall be final and shall not be appealable to the City Council or to any other City body or official.

Reference Sheet

FORM-031 Construction & Demolition Management Plan can be obtained from longbeach.gov/lbds/forms/.

To request this information in an alternative format or to request a reasonable accommodation, please contact the Development Services Department at longbeach.gov/lbds and 562.570.3807. A minimum of three business days is requested to ensure availability; attempts will be made to accommodate requests with shorter notice.



Construction & Demolition Management Plan

The Construction and Demolition (C&D) Recycling Program encourages the use of green building techniques and promotes the reuse, salvage and/or deconstruction of all recyclable materials in construction, deconstruction, and/or demolition projects. As part of the City's commitment to sustainable development, your project is required to divert at least 65% of recyclable construction waste.

Project Address: _____ **Project No.:** _____ **Date:** _____

PROJECT DESCRIPTION:

Project Valuation: _____ \$
Deposit (3% of Valuation \$1,605 min., \$53,425 max) _____ \$
Administrative Fee (Residential \$210, Commercial \$415) _____ \$

Project Type	RESIDENTIAL			NON-RESIDENTIAL		
	Remodel/ Additions	New Construction	Demolition/ Removal	Remodel/ Additions	New Construction	Demolition/ Removal
Project Size (SF)						
Lbs/sf per project type	3.31	4.38	115.00	2.85	3.89	155.00
Calculated Weight(s) in Tons	0.00	0	0	0	0	0.00

ESTIMATED PROJECT TOTAL:

Estimated Generated Amount (in tons) _____

65% Diversion Required to Meet:

At least 65% of all generated materials must be diverted. _____ tons _____ lbs

20% of Inert Debris (i.e., concrete, asphalt, dirt, etc.):

Maximum 20% of inert materials _____ tons _____ lbs

Comments _____

I. I acknowledge that within thirty (30) days after final inspection for the above project, the completed Final Compliance Report (see back) shall be submitted. I further acknowledge that the amount of C&D Deposit returned will be prorated based on the rate of compliance and that the Return of Deposit should be made payable to:

Name: _____
 Address: _____
 City/ST/Zip: _____
 Phone No: () _____ Email: _____

II. I further acknowledge that a copy of this C&D Management Plan will be sent to the property / business owner listed below:

Same as above

Name: _____
 Address: _____
 City/ST/Zip: _____
 Phone No: () _____ Email: _____

FINAL COMPLIANCE REPORT

Address: _____

Project No.: _____

Final Date: _____

Within thirty (30) days after final inspection for this project, please provide the names of all certified recyclers, salvage companies, or recycling, mixed use or repurpose facilities, by material type, that were used for disposal of C&D debris and the total weights of each material. Please submit the Final Compliance Report and all supporting documentation to the Long Beach Development Permit Center or by email at Construct-Demo@LongBeach.gov.

NAME OF PERMITTED HAULER _____

The program requires applicants to either self-haul material(s) or to use a waste hauler that is permitted to haul within the City of Long Beach. [A list of permitted haulers.](#)

	Disposal Facility Name longbeach.gov/lbds/building/cd/	Weights (Ton/lbs)
MIXED DEBRIS		
Facility #1		
Facility #2		
Facility #3		
Total Tons Diverted - Mixed Debris		
ITEMIZED DEBRIS - INERT		
Concrete/Block/Brick		
Asphalt/Aggregates/Dirt		
Other		
Total Tons Diverted - Inert		
Max Allowed: _____		
	tons	lbs
ITEMIZED DEBRIS - NON-INERT		
Drywall		
Metal/scrap iron		
Plastic		
Roofing		
Wood		
Other		
Total Tons Diverted - Non-Inert		
TOTAL TONS GENERATED		
Target Wt: _____		
	tons	lbs

To the best of my knowledge, the above information is an accurate representation of the disposition of the construction and demolition materials generated on-site at the construction job. I understand that the City of Long Beach may audit disposal and recycling documentation.

Name of Owner/Agent	Signature	Date
----------------------------	------------------	-------------

I am aware that I may file an appeal to a Hearing Officer regarding any compliance ruling made pursuant to Long Beach Municipal Code §18.67.070 within ten (10) days of the date that a ruling is made. The decision of the Hearing Officer conducting the appeal is final and is not appealable to the City Council or to any other City body or official in accordance with of Long Beach Municipal Code §18.67.090.

OFFICE USE ONLY

Diversion Requirement Met:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
% of Diversion Met:	_____ %	
Amount of Deposit:	\$ _____	Amount to be Returned: \$ _____
Final Report Approved By:	_____	
Comments:	_____	

To request this information in an alternative format or to request a reasonable accommodation, please contact the Development Services Department at longbeach.gov/lbds and 562.570.3807. A minimum of three business days is requested to ensure availability; attempts will be made to accommodate requests with shorter notice.

Local: City of Long Beach Standard Plans – Available at
<http://www.longbeach.gov/pw/resources/engineering/standard-plans/>
Web links to City of Long Beach Standard Plans

DIVISION F
PERMITS &
ATTACHMENTS



TWINING

Engineering a Better Tomorrow

Geotechnical Investigation Report

**Proposed Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California**

Prepared for:

City of Long Beach Public Works Department
411 West Ocean Boulevard
Long Beach, California 90807

July 1, 2021
Project No.: 210377.1



2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

July 1, 2021
Project No.: 210377.1

Mr. Derry McMahon
Project Manager
City of Long Beach Public Works Department
411 West Ocean Boulevard
Long Beach, California 90807

Subject: Geotechnical Investigation Report
Proposed Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

Dear Mr. McMahon,

In accordance with your request and authorization, we are presenting the results of our geotechnical investigation for the proposed Fire Station No. 9 project located at 4101 Long Beach Boulevard in Long Beach, California. The purpose of our investigation is to characterize subsurface conditions of the site, evaluate seismic and geohazards at the site, and provide geotechnical engineering recommendations for the proposed improvements, including recommendations for foundations and earthwork.

This report was prepared in accordance with the requirements of the 2019 California Building Code (2019 CBC) and ASCE 7-16 (ASCE, 2017). Based on our findings, the proposed project is geotechnically feasible, provided that the recommendations in this report are incorporated into the design and are implemented during construction of the project.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
TWINING, INC.



A handwritten signature in blue ink, appearing to read "Liangcai He".

Liangcai He, PhD, PE 73280, GE 3033
Chief Geotechnical Engineer



A handwritten signature in blue ink, appearing to read "Paul C. Soltis".

Paul Soltis, PE 56140, GE 2606
Vice President, Geotechnical Engineering

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Appendices

- Appendix A – Field Exploration
- Appendix B – Laboratory Testing

1. INTRODUCTION

This report presents the results of the geotechnical investigation performed by Twining, Inc. (Twining) for the proposed Fire Station No. 9 project located at 4101 Long Beach Boulevard in Long Beach, California. A description of the site and the proposed improvements is provided in the following section. The objectives of this investigation have been to characterize subsurface conditions of the site, evaluate seismic and geohazards at the site, and provide geotechnical recommendations for design and construction of the proposed development, including recommendations for foundations and earthwork. Our investigation was performed in conformance with the 2019 California Building Code (2019 CBC) and ASCE 7-16 (ASCE, 2017).

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The project site is located at 4101 Long Beach Boulevard in Long Beach, California, as shown on Figure 1 – Site Location Map. The approximate site coordinates are latitude 33.83248°N and longitude 118.18966°W, on the Long Beach, California 7½-Minute Quadrangle, according to the United States Geological Survey (USGS) topographic maps (USGS 2018). The site is bound by an alley and residences on the north, Long Beach Boulevard on the east, E. Randolph Place on the south, and residences on the west. The site is relatively flat with a surface elevation at approximately 95 feet above mean sea level (msl).

The site is currently occupied by a one-story building, concrete pavement, and minor landscaping. Based on information from City of Long Beach Public Works Department, it is our understanding that the existing building will be demolished. The proposed project will consist of the construction of a fire station, drainage basin, and improvements to the adjacent alley. Associated improvements such as utility trenches and pavements are anticipated. The locations and footprint of the proposed construction are depicted on Figure 2 – Site Plan and Boring Location Map.

3. SCOPE OF WORK

Our scope of work included review of background information, pre-field activities and field exploration, laboratory testing, engineering analyses and report preparation. These tasks are described in the following subsections.

3.1. Literature Review

We reviewed readily available background data including proposed site improvement plans, published geologic maps, topographic maps, aerial photographs, seismic hazard maps and literature, and flood hazard maps relevant to the subject site. Relevant information has been incorporated into this report. A partial list of literature reviewed is presented in the “Selected References” section of this report.

3.2. Pre-Field Activities

Before starting our exploration program, we performed a geotechnical site reconnaissance to observe the general surficial conditions at the site and to select field exploration locations. After exploration locations were delineated, Underground Service Alert was notified of the planned locations a minimum of 72 hours prior to excavation. The locations were cleared of buried utilities



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by a private utility locator. We obtained a permit for the field exploration from the Department of Health and Human Services of the City of Long Beach (LBDHHS).

3.3. Field Exploration

The field exploration consisted of drilling, testing, sampling, and logging of 8 exploratory borings (B-1 through B-6, P-1, and P-2) and percolation testing in 2 of the borings (P-1 through P-2) conducted at the site on June 4, 2021. The approximate exploration locations are shown on Figure 2 – Site Plan and Boring Location Map.

The borings were advanced to approximate depths of 5 to 81.5 feet below ground surface (bgs) using a CME-75 truck-mounted drill rig equipped with 8-inch-diameter hollow-stem-auger (HSA). All borings were first excavated to 5 feet bgs using a hand-auger to clear potential underground utilities.

Drive samples of the soils were obtained from the borings using a Standard Penetration Test (SPT) sampler without room for liner and a modified California split-spoon sampler. The samplers were driven using a 140-pound automatic hammer falling approximately 30 inches. The blow counts to drive the samplers were recorded, and subsurface conditions encountered in the borings were logged by a Twining field engineer under the supervision of a California Registered Engineering Geologist. Bulk samples were collected from the upper 5-foot soil cuttings. The samples were transported to Twining's geotechnical engineering laboratory in Long Beach, California for examination and testing.

In-situ percolation testing was performed in boring P-1 and P-2, which were advanced to 5 feet bgs, to provide estimates of infiltration rate of the site soils.

Upon completion of exploration, the borings deeper than 5 feet were backfilled with lean concrete grout. The 5-foot-deep borings were backfilled with soil cuttings. The surface was repaired to match existing conditions.

Detailed descriptions of the field exploration, soils encountered during drilling, and the LBDHHS permit are presented in Appendix A – Field Exploration.

3.4. Geotechnical Laboratory Testing

Laboratory tests were performed on selected samples obtained from the borings to aid in the soil classification and to evaluate the engineering properties of site soils. The following tests were performed in general accordance with ASTM and Caltrans standards:

- In-situ moisture and density (ASTM D2937),
- #200 Wash (ASTM D1140),
- Atterberg Limits (ASTM D4318),
- Expansion Index (ASTM D4829),
- Consolidation (ASTM D2435),
- Direct shear (ASTM D3080),
- Maximum dry density and optimum moisture content (ASTM D1557),
- Resistance value (R-value) (ASTM D2844), and
- Corrosivity (Caltrans test methods CT417, CT422, and CT 643).

Detailed laboratory test procedures and results are presented in Appendix B – Laboratory Testing.

3.5. Engineering Analyses and Report Preparation

We compiled and analyzed the data collected from our field exploration and laboratory testing. We performed engineering analyses based on our literature review and data from field exploration and laboratory testing programs. Our analyses included the following:

- Site geology, and subsurface conditions,
- Groundwater conditions,
- Geologic hazards and seismic design parameters,
- Liquefaction potential and seismic settlement,
- Soil corrosion potential,
- Soil collapse and expansion potential,
- Site preparation and earthwork,
- Project feasibility and suitability of on-site soils for foundation support,
- Foundation design parameters including bearing capacity, settlement, and lateral resistance,
- Concrete slab-on-grade support,
- Modulus of subgrade reaction for concrete slab-on-grade design,
- Temporary excavations, and
- Pavement section recommendations.

We prepared this report to present our conclusions and recommendations from this investigation.

4. GEOLOGY AND SUBSURFACE CONDITIONS

The regional and site geology and subsurface conditions are described in this section, based on our data review and field investigation. A portion of the geologic map is reproduced as Figure 3 – Geologic Map. Detailed subsurface conditions are presented in Appendix A – Field Exploration.

4.1. Regional Geology

According to the Geologic Map of the Long Beach 30' × 60' quadrangle (Saucedo et al., 2016), the project site is underlain by Old Shallow Marine Deposits on Wave-Cut Surface (geologic map symbol Qom) that are late to middle Pleistocene in age. The deposits consist of poorly sorted, somewhat permeable siltstone, sandstone, and conglomerate that are reddish-brown in color (Saucedo et al., 2016). These deposits accumulated in strandline, beach, and estuarine environments and rest on platforms that have been carved by wave action and pushed up from below the water by regional uplift (Saucedo et al., 2016). A portion of the geologic map is reproduced as Figure 3 – Geologic Map.

4.2. Surface and Subsurface Conditions

As described earlier, the site is currently occupied by a one-story building, concrete pavement, and landscaping. The pavement section encountered in the borings consisted of 3 to 6 inches of concrete underlain by approximately 2.5 feet of fill materials. The fill consisted of slightly moist lean clay and sandy lean clay.



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The native materials encountered below the fill materials consisted primarily of lean clay and sandy silt in the upper 60 feet with layers of silty sand between 15 and 20 feet bgs and between 45 and 50 feet bgs. The materials encountered below 60 feet bgs consisted of silty sand.

The consistency of the lean clay and silt varied from stiff to very stiff and hard. Relative density of the silty sand was dense below 45 feet bgs and medium dense in the upper layers. The color of the materials varied from medium brown to reddish brown, strong brown, olive brown and dark yellowish brown. The materials were slightly moist. Detailed descriptions of the soils encountered during drilling are presented in Appendix A – Field Exploration.

4.3. Groundwater

No groundwater was encountered to the maximum exploration depth of approximately 81.5 feet bgs. The Seismic Hazard Zone report (California Department of Conservation, Division of Mines and Geology, 1998) presented the historically highest groundwater contour map for the Long Beach Quadrangle. However, the historical high groundwater level at the site is not well defined on the contour map. We researched historical water level data in the vicinity of the site. Based on the groundwater well database of Los Angeles County Department of Public Works (LADPW), historical groundwater level between August 1, 1934 and May 6, 2021 is available from a groundwater well located approximately 0.43 miles northwest of the site (Well ID 906D and State Well ID 4S13W12K01). Groundwater level in the well decreased over the years, and the highest level was deeper than 70 feet recorded at elevation 14 feet msl on April 17, 1935.

Groundwater conditions may vary across the site due to stratigraphic and hydrologic conditions and may change over time as a consequence of seasonal and meteorological fluctuations, or of activities by humans at this and nearby sites.

5. GEOLOGIC HAZARDS AND SEISMIC DESIGN CONSIDERATIONS

The site is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered high during the design life of the proposed development. The hazards associated with seismic activity in the vicinity of the site area discussed in the following sections.

5.1. Active Faulting and Surface Fault Rupture

The subject site is not located within a State of California Earthquake Fault Zone (formerly known as a Special Studies Zone) (Hart and Bryant, 1997). The boundary of the closest Alquist-Priolo EFZs is located approximately 0.6 miles southwest of the site associated with the Long Beach fault zone (part of the Newport-Inglewood fault zone). Figure 4 shows the location of the fault zone with respect to the site. The current general plans of the City of Long Beach and the County of Los Angeles do not identify any additional hazardous faults in the immediate site vicinity.

Based on our review of geologic and seismologic literature and our site evaluation, it is our opinion that the likelihood of surface fault rupture at the site during the life of the proposed project is remote.

5.2. Liquefaction and Seismic Settlement Potential

Liquefaction is the phenomenon in which loosely deposited granular soils with silt and clay contents of less than approximately 35 percent, and non-plastic silts located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground

shaking of sufficient duration results in the loss of grain-to-grain contact due to a rapid rise in pore water pressure and causes the soil to behave as a fluid for a short period of time.

Liquefaction is generally known to occur in loose, saturated, relatively clean, fine-grained cohesionless soils at depths shallower than approximately 50 feet. Factors to consider in the evaluation of soil liquefaction potential include groundwater conditions, soil type, grain size distribution, relative density, degree of saturation, and both the intensity and duration of ground motion. Other phenomena associated with soil liquefaction include sand boils, ground oscillation, and loss of foundation bearing capacity.

The project site is not within a state-designated Zone of required investigation for liquefaction according to CGS (2016). Based on the great depth of groundwater and site subsurface conditions, it is our opinion that liquefaction potential and seismic settlement at the site is low.

5.3. Landslides

The area of the project site is not within an area with the potential for earthquake-induced landslides. Considering the site is flat and not close to significant slopes, the potential for earthquake-induced landslides to occur at the site is considered negligible.

5.4. Tsunamis and Seiches

Tsunamis are waves generated by massive landslides near or under sea water. Based on California Official Tsunami Inundation Maps, the site is not located on any State of California Tsunami Inundation Map for Emergency Planning. The potential for the site to be adversely impacted by earthquake-induced tsunamis is considered to be negligible.

Seiches are standing wave oscillations of an enclosed water body after the original driving force has dissipated. The potential for the site to be adversely impacted by earthquake-induced seiches is considered to be negligible due to the lack of any significant enclosed bodies of water located in the vicinity of the site.

5.5. Flooding

The Federal Emergency Management Agency (FEMA) has prepared flood insurance rate maps (FIRMs) for use in administering the National Flood Insurance Program, effective September 26, 2008. Based on our review of online FEMA flood mapping, the site is located within Zone X with minimal flood hazard.

5.6. Deaggregated Seismic Source Parameters

We performed a seismic hazard de-aggregation analysis for the peak ground acceleration with a probability of exceedance of 2% in 50 years. The analysis used the USGS Unified Hazard Tool based on the 2014 USGS seismic source model. The results of the analysis indicate the controlling modal moment magnitude and fault distance are 7.3 Mw and 3.8 miles (6.1 km), respectively.

5.7. Site Class for Seismic Design

According to our field exploration program, the average SPT resistance for the upper 80 feet is in the range between 15 and 50 blows per foot. Using the SPT resistance obtained from the field exploration, we estimated the shear-wave velocity (V_s) profile and an average V_s for the upper 100 feet of the soil profile (V_{s30}) of approximately 932 feet/sec or 284 m/sec. Based on the SPT resistance



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and the V_{S30} value, it is our opinion that Site Class D may be used for the project seismic design according to Chapter 20 of ASCE 7-16.

5.8. Seismic Design Parameters

Seismic design for new buildings should be based on the 2019 CBC and ASCE 7-16. As the site is classified as seismic Site Class D and the mapped spectral acceleration parameter at period 1-second, S_1 , is greater than 0.2 g, the 2019 CBC requires a site-specific ground motion hazard analysis following Section 11.4.7 of ASCE 7-16 for new buildings. The site-specific ground motion hazard analysis is presented in Section 5.9.

Alternatively, Exception 2 in Section 11.4.8 of ASCE 7-16 may be used for the project new buildings in lieu of the site-specific ground motion hazard analysis. For seismic design of new buildings based on this exception, seismic design parameters in Table 1 may be used, based on site coordinates of latitude 33.83248°N and longitude $118.18966^{\circ}\text{W}$.

**Table 1 – Seismic Design Parameters Based on 2019 CBC and ASCE 7-16
for Design Based on Exception 2 in Section 11.4.8 of ASCE 7-16**

Design Parameters	Value
Site Class	D
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s (g)	1.663
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1 (g)	0.598
Site Coefficient, F_a	1
Site Coefficient, F_v	1.702
Adjusted MCE_R^1 Spectral Response Acceleration Parameter, S_{MS} (g)	1.663
Adjusted MCE_R^1 Spectral Response Acceleration Parameter, S_{M1} (g)	1.0
Design Spectral Response Acceleration Parameter, S_{DS} (g)	1.109
Design Spectral Response Acceleration Parameter, S_{D1} (g)	0.679
Risk Coefficient, C_{RS}	0.903
Risk Coefficient, C_{R1}	0.901
Peak Ground Acceleration, PGA_M^2 (g)	0.796
Seismic Design Category ³	D
Long-Period Transition Period, T_L (seconds)	8
$T_s = S_{D1} / S_{DS}$	0.612
When using the above parameters for seismic design, the seismic design coefficient C_s should be calculated as follows: For $T \leq 1.5T_s$, $C_s = S_{DS}/(R/I_e)$ For $T_L \geq T > 1.5T_s$, $C_s = 1.5 S_{D1}/(T R/I_e)$ For $T > T_L$, $C_s = 1.5 (S_{D1} T_L)/(T^2 R/I_e)$ where T = the fundamental period of the structure(s) determined in Section 12.8.2 of ASCE 7-16; R = the response modification factor determined in Table 12.2-1 of ASCE 7-16; and I_e = the importance factor determined in accordance with Section 11.5.1 of ASCE 7-16.	
Notes: ¹ Risk-Targeted Maximum Considered Earthquake. ² Peak Ground Acceleration adjusted for site effects. ³ For S_1 greater than or equal to 0.75g, the Seismic Design Category is E for risk category I, II, and III structures and F for risk category IV structures.	

5.9. Site-Specific Seismic Hazard Analysis and Seismic Design Parameters

The site-specific ground motion hazard analysis was performed in accordance with Section 21.2 of ASCE 7-16 based on a 2% probability of exceedance in 50 years. To develop the site-specific design response spectrum, we performed probabilistic seismic hazard analysis (PSHA) and deterministic seismic hazard analysis (DSHA) to compute the risk-targeted maximum considered earthquake (MCE_R) response accelerations. Our PSHA and DSHA used four NGA-West2 ground motion prediction equations (GMPEs) developed by Abrahamson et al. (2014), Boore et al. (2014), Campbell and Bozorgnia (2014), and Chiou and Youngs (2014), respectively. The analyses were based on the Uniform California Earthquake Rupture Forecast Version 3 (UCERF3) developed by the Working Group on California Earthquake Probabilities (WGCEP). UCERF3 is the California portion of the 2014 USGS national seismic source model (Petersen et al. 2014). Our analyses included treatment of maximum direction spectra and adjustment for risk targeting.

The analyses were performed assuming a $V_{S,30}$ value of 932 feet/sec or 284 m/sec discussed in Section 5.7 and site coordinates of latitude 33.83248°N and longitude 118.18966°W described in Section 2. The site-specific design response spectrum is presented in Section 5.9.3, along with the MCE_R ground motions from our PSHA and DSHA. The site-specific design response spectrum is presented in Section 5.9.4. The detailed analysis description and results are presented below.

5.9.1. Probabilistic Seismic Hazard Analysis

A site-specific PSHA was performed to evaluate probabilistic MCE_R ground motions. The probabilistic spectral response accelerations are taken as the spectral response accelerations in the direction of maximum horizontal response represented by a 5% damped acceleration response spectrum that is expected to achieve a 1% probability of collapse within a 50-year period. In this report, ordinates of the probabilistic ground motion response spectrum were determined by Method 1 of Section 21.2.1.1 of ASCE 7-16.

The PSHA was first performed using the Hazard Spectrum Calculator by OpenSHA.org (<http://www.opensha.org/apps-HazardSpectrumLocal>) to obtain an average spectrum of the geometric-mean acceleration response spectra from the four NGA-West2 GMPEs. The spectra were calculated for 5-percent damped and a 2 percent probability of exceedance within a 50-year period. The average spectrum was converted to the maximum response ground motion using scale factors described in Section 21.2 of ASCE 7-16. The scale factors are 1.1 for spectral response periods less than or equal to 0.2 s, 1.3 for a period of 1.0 s, 1.5 for periods greater than or equal to 5.0 s, and between these periods are obtained by linear interpolation. The maximum response ground motion was then multiplied by a risk coefficient C_R to obtain the probabilistic MCE_R ground motion response spectrum. The values of C_R are C_{RS} for periods less than or equal to 0.2 s and C_{R1} for periods greater than or equal to 1.0 s. For periods between periods 0.2 s and 1.0 s, C_R is based on linear interpolation of C_{RS} and C_{R1} . The values of C_{RS} and C_{R1} for this project are presented in Table 1.

5.9.2. Deterministic Seismic Hazard Analysis

A site-specific DSHA was performed to evaluate the deterministic MCE_R ground motions. The deterministic MCE_R response acceleration at specified periods was calculated as the 84th percentile of the maximum rotated component of ground motion computed at each period for characteristic earthquakes on known active faults within the region.

The controlling active faults and their parameters used in our DSHA are provided in Table 2. The DSHA was performed for each fault to obtain the 5-percent-damped deterministic pseudo-absolute acceleration response spectrum using the four NGA-West2 GMPEs implemented in a Microsoft Excel spreadsheet available from the Pacific Earthquake Engineering Research Center (<https://peer.berkeley.edu/research/data-sciences/databases>).

Table 2 - Seismic Source Parameters

Fault Name	Newport-Inglewood alt 1	Newport-Inglewood alt 2	Compton	Palos Verdes
Slip Sense	Strike Slip	Strike Slip	Reverse	Strike Slip
M_w	7.2	7.2	6.9	7.3
Dip, (deg)	88	90	20	90
Z_{TOR} (km)	0	0	5.2	0
Z_{BOT} , (km)	15	10.2	15.6	13.6
W (km)	15.0	10.2	30.4	13.6
R_{RUP} (km)	1.49	1.17	7.88	11.3
R_{JB} (km)	1.49	1.17	0	11.3
R_x (km)	1.49	1.17	8.75	11.3
F_{NM}	0	0	0	0
F_{RV}	0	0	1	0

Notes:

- M_w = Moment magnitude.
- Z_{TOR} = The depth to the top of the rupture plane.
- Z_{BOT} = The depth to the bottom of the rupture plane.
- W = Fault rupture width.
- R_{RUP} = Closest distance to coseismic rupture.
- R_{JB} = Closest distance to surface projection of coseismic rupture.
- R_x = Horizontal distance from top of rupture measured perpendicular to fault strike.
- F_{RV} = Reverse-faulting factor: 0 for strike-slip, normal, normal-oblique; 1 for reverse, reverse-oblique and thrust.
- F_{NM} = Normal-faulting factor: 0 for strike slip, reverse, reverse-oblique, thrust and normal-oblique; 1 for normal.

The resulting 84th percentile geometric-mean acceleration response spectra for the earthquakes were used to develop a deterministic response spectrum based on the greatest spectral acceleration at each period, and then converted into maximum rotated components of ground motion using the scale factors described in Section 21.2 of ASCE 7-16 as discussed in Section 5.9.1 of this report. The final deterministic MCE_R is taken as the maximum rotated deterministic response spectrum scaled by a single factor equal to the greater of $1.5F_a/S_{a,max,max}$ and 1, where $S_{a,max,max}$ is the maximum spectral acceleration of the maximum rotated deterministic response spectrum, and F_a is determined to be 1 using Table 11.4.1 of ASCE 7-16.

5.9.3. Site-Specific Design Response Spectrum

The site-specific MCE_R spectral response acceleration was calculated at each period to be the lesser of the spectral response accelerations from the probabilistic and deterministic MCE_R , but not less than 1.5 times 80 percent of the spectral acceleration evaluated in accordance with Sections 11.4.6 and 21.3 of ASCE 7-16. In order to calculate the 80 percent of the spectral acceleration, values of S_{DS} , S_{D1} and the design spectrum were calculated using the mapped values presented in Table 1, except that S_{M1} and S_{D1} at this step were based on an F_v value of 2.5, in accordance with Section 21.3 of ASCE 7-16.

Finally, the site-specific design spectral response acceleration at each period was calculated as two-thirds of the site-specific MCE_R spectral acceleration. The site-specific design response spectrum and relevant response spectral data are presented in Table 3 and Figure 5.

Table 3 - Site-Specific Design Response Spectrum Data

Period T (sec)	General Procedure Design Response Spectrum for Exception 2 of ASCE 7-16 (g)	Risk Coefficient C_R	Site-Specific Ground Motion Analysis Spectral Accelerations (g)						
			Maximum direction 2%-in-50-years Probabilistic Spectrum	Probabilistic MCE_R	Maximum direction 84th-percentile Deterministic Spectrum	Deterministic MCE_R	80% General Procedure Design Response Spectrum with $F_v=2.5$	Site Specific MCE_R	Site-Specific Design Response Spectrum
0.01	0.498	0.903	0.861	0.778	1.025	1.025	0.384	0.778	0.518
0.02	0.552	0.903	0.865	0.781	1.030	1.030	0.414	0.781	0.521
0.03	0.606	0.903	0.888	0.802	1.041	1.041	0.444	0.802	0.535
0.05	0.715	0.903	1.015	0.916	1.156	1.156	0.503	0.916	0.611
0.075	0.851	0.903	1.263	1.140	1.364	1.364	0.577	1.140	0.760
0.1	0.987	0.903	1.483	1.339	1.573	1.573	0.651	1.339	0.893
0.122	1.109	0.903	1.606	1.450	1.694	1.694	0.717	1.450	0.967
0.15	1.109	0.903	1.757	1.586	1.843	1.843	0.799	1.586	1.058
0.18	1.109	0.903	1.846	1.667	1.980	1.980	0.887	1.667	1.111
0.2	1.109	0.903	1.907	1.722	2.073	2.073	0.887	1.722	1.148
0.25	1.109	0.903	2.034	1.836	2.260	2.260	0.887	1.836	1.224
0.3	1.109	0.903	2.131	1.924	2.457	2.457	0.887	1.924	1.283
0.4	1.109	0.903	2.141	1.932	2.618	2.618	0.887	1.932	1.288
0.5	1.109	0.902	2.076	1.873	2.567	2.567	0.887	1.873	1.249
0.612	1.109	0.902	1.929	1.740	2.453	2.453	0.887	1.740	1.160
0.75	0.905	0.902	1.749	1.577	2.314	2.314	0.887	1.577	1.051
0.899	0.755	0.901	1.592	1.435	2.174	2.174	0.887	1.435	0.957
1	0.679	0.901	1.486	1.339	2.079	2.079	0.797	1.339	0.893
1.5	0.452	0.901	1.033	0.931	1.511	1.511	0.532	0.931	0.621
2	0.339	0.901	0.773	0.697	1.143	1.143	0.399	0.697	0.464
3	0.226	0.901	0.500	0.451	0.771	0.771	0.266	0.451	0.301
4	0.170	0.901	0.352	0.317	0.535	0.535	0.199	0.317	0.211
5	0.136	0.901	0.274	0.247	0.392	0.392	0.159	0.247	0.165

5.9.4. Site-Specific Seismic Design Parameters

The site-specific seismic design parameters are provided in Table 4. These parameters were determined from the site-specific design response spectrum presented in Table 3 following Section 21.4 of ASCE 7-16.

It should be noted that for use with the equivalent lateral force procedure in structural design, the site specific design spectral acceleration, S_a (the last column in Table 3 of this report), at period T may replace S_{D1}/T and $S_{D1}T_L/T^2$ in ASCE 7-16 Eqs. (12.8-3) and (12.8-4), respectively. The site-specific seismic design parameter S_{DS} shown in Table 4 of this report may be used in ASCE 7-16 Eqs. (12.8-2), (12.8-5), (15.4-1), and (15.4-3). The mapped value of S_1 in Table 1 of this report should be used in ASCE 7-16 Eqs. (12.8-6), (15.4-2), and (15.4-4).

Table 4 - Site-Specific Seismic Design Parameters

Site-Specific Seismic Design Parameters	Design Values (g)
Spectral Response Acceleration 0.2-second period, S_{MS}	1.74
Spectral Response Acceleration 1-second period, S_{M1}	1.40
Design Spectral Response Acceleration for short period, S_{DS}	1.16
Design Spectral Response Acceleration for 1-second period, S_{D1}	0.93
MCE Geomatric Mean (MCE_G) Peak Ground Acceleration, PGA_M	0.78



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6. GEOTECHNICAL ENGINEERING RECOMMENDATIONS

Based on the results of our literature review and the field exploration, laboratory testing, and engineering analyses, it is our opinion that the proposed construction is feasible from a geotechnical standpoint, provided that the recommendations in this report are incorporated into the design plans and are implemented during construction.

6.1. General Considerations

Geotechnical engineering recommendations presented in this report for the proposed project are based on our understanding of the proposed development, subsurface conditions encountered during our field exploration, the results of laboratory testing on soil samples taken from the site, and our engineering analyses. Based on our field exploration, the site is covered by 3 to 6 inches of concrete pavement underlain by approximately 2.5 feet of fill materials consisting of slightly moist lean clay and sandy lean clay.

The following sections present our conclusions and recommendations pertaining to the engineering design for this project. If the design substantially changes, then our geotechnical engineering recommendations would be subject to revision based on our evaluation of the changes.

6.2. Soil Expansion and Collapse Potential

Based on our field exploration and laboratory testing results, the risk of soil expansion and collapse is low at the site. Soil expansion and collapse potentials are considered to have negligible effects on the design and construction of the project.

6.3. Corrosive Soil Evaluation

In accordance with the County of Los Angeles (2014) criteria, corrosive soil is defined as the soil has minimum electrical resistivity less than 1,000 ohm-centimeters, or chloride concentration greater than 500 ppm, or sulfate concentration in soils greater than 2,000 ppm, or a pH less than 5.5.

The potential for the near-surface on-site materials to corrode buried steel and concrete improvements was evaluated. Laboratory testing was performed on one selected near-surface soil to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with California Test 643, and the sulfate and chloride tests were performed in accordance with California Tests 417 and 422, respectively. These laboratory test results are presented in Appendix B – Laboratory Testing.

Discussions of corrosion protection for reinforced concrete and buried metal is provided below. Further interpretation of the corrosivity test results and associated corrosion design and construction recommendations are within the purview of a corrosion specialist. It is recommended that a qualified corrosion engineer be retained to review our corrosivity test results, to evaluate the general corrosion potential with respect to construction materials at the site, and to review the proposed design.

6.3.1. Reinforced Concrete

Laboratory tests indicate that the soil has less than 1,000 ppm or 0.1% of water soluble sulfate (SO_4) by weight. Based on ACI 318, concrete in contact with the site soils will have a sulfate exposure class S0. As a minimum, we recommend that Type II cement and a water-cement ratio of no greater than 0.50 be used on the project.

Test results indicate that the soil has less than 500 ppm of water soluble chlorides by weight and the potential for chloride attack of reinforcing steel in concrete structures and pipes in contact with soil is negligible.

6.3.2. Buried Metal

A factor for evaluating corrosivity to buried metal is electrical resistivity. The electrical resistivity of a soil is a measure of resistance to electrical current. Corrosion of buried metal is directly proportional to the flow of electrical current from the metal into the soil. As resistivity of the soil decreases, the corrosivity generally increases. Test results indicate the site soils have minimum electrical resistivity value of 3,600 ohm-centimeters. According to the County of Los Angeles (2014) criteria, the site soils are not corrosive.

Correlations between resistivity and corrosion potential published by the National Association of Corrosion Engineers (NACE, 1984) indicate that the soils have a mildly corrosive potential to buried metals. For design based on the NACE (1984) criteria, corrosion protection for metal in contact with site soils should be considered. Corrosion protection may include the use of epoxy or asphalt coatings.

6.4. Site Preparation and Earth Work

In general, earthwork should be performed in accordance with the recommendations presented in this report. Twining should be contacted for questions regarding the recommendations or guidelines presented herein.

6.4.1. Site Preparation

Site preparation should begin with the removal of utility lines, asphalt, concrete, vegetation, and other deleterious debris from areas to be graded. Tree stumps and roots should be removed to such a depth that organic material is not present. Clearing and grubbing should extend to the outside edges of the proposed excavation and fill areas. We recommend that unsuitable materials such as organic matter or oversized material be removed and disposed offsite. The debris and unsuitable material generated during clearing and grubbing should be removed from areas to be graded and disposed of at a legal dump site away from the project area.

6.4.2. Existing Underground Utilities

Existing underground utilities are expected in the project area, and some of them may cross proposed footings for the new buildings. Relocation of either the lines or footings to avoid the lines crossing the new footings is recommended as the footings will induce pressure on the lines. If relocation is not possible, existing utilities should be protected in place, and greater care should be exercised during excavation to avoid damaging the utilities. Utilities below a footing or the 1:1 plane projected out and down from the closest bottom edge of the footing should be encased. The encasement should have a minimum clearance of one inch all-around between the protected utility lines and the casing pipe. The casing pipe should be sealed at both ends.

Utilities in other areas should meet the minimum requirements for clearance and depth of cover for the County of Los Angeles; otherwise, encasement protection is recommended to provide a minimum clearance of one inch all-around between the protected utility lines and the casing pipe.

6.4.3. Temporary Excavations

Temporary excavations for the project are expected. We anticipate that unsurcharged excavations with vertical side slopes less than 4 feet high will generally be stable; however, if excavation extends to the sandy soil layers, some sloughing of cohesionless sandy materials encountered at the site should be expected.

Where space is available, temporary, un-surcharged excavation sides over 4 feet in height should be sloped no steeper than an inclination of 1.5H:1V (horizontal:vertical). Where sloped excavations are created, the tops of the slopes should be barricaded so that vehicles and storage loads are away from the top edge of the excavated slopes with a distance at least equal to the height of the slopes. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. Twining should be advised of such heavy vehicle loadings so that specific setback requirements can be established. If the temporary construction slopes are to be maintained during the rainy season, berms are recommended to be graded along the tops of the slopes in order to prevent runoff water from entering the excavation and eroding the slope faces.

Excavations shall not undermine the existing adjacent footings. Where space for sloped excavations is not available, slot-cut or temporary shoring may be utilized. Shoring recommendations are provided in Section 6.11.

Personnel from Twining should observe the excavations so that any necessary modifications based on variations in the encountered soil conditions can be made. All applicable safety requirements and regulations, including CalOSHA requirements, should be met. Stability of temporary excavations is the responsibility of the contractor.

6.4.4. Over-Excavation and Subgrade Preparation

Proposed structures may be supported by conventional shallow foundations. To minimize potential differential settlement, the foundations should all bear on at least 2 feet of non-expansive engineered fill or all on native soils, depending on embedment of foundations and thickness of undocumented fill encountered during construction. If the bottom of fill is deeper than the bottom of foundation, foundation excavation should extend to the bottom of undocumented fill or at least 2 feet below the bottom of foundation, whichever is deeper; if the bottom of fill is not deeper than the bottom of foundation, no over-excavation is necessary.

For minor structures and slabs-on-grade that are structurally separated from the building, the over-excavation should extend to at least 2 feet below the bottom of the footing of the minor structures and slabs-on-grade. Excavation for pavements and hardscape should be over-excavated at least 1 foot as measured from the bottom of the pavement or hardscape section. However, over-excavation may terminate at a shallower depth if native soils are encountered.

Where feasible, excavation should extend laterally beyond the foundation limits a minimum distance equal to 3 feet or the depth of over-excavation, whichever is greater. Excavation for other improvements (e.g., concrete walkways, flatwork, pavement) should extend laterally at least 2 feet beyond the limits of the improvements.

The extent and depths of all removal should be evaluated by Twining's representative in the field based on the materials exposed. Should excavations expose soft soils or soils considered unsuitable for use as fill by a Twining representative, additional removals may be recommended.

For example, deeper removal may be required in areas where soft, saturated, or organic materials are encountered.

The exposed excavation bottom should be evaluated and approved by Twining. Prior to placement of fill or placement of reinforcing steel or concrete for foundations, the bottom should be scarified to a minimum depth of 6 inches and moisture conditioned to achieve generally consistent moisture contents approximately 2 percent above the optimum moisture content. The scarified bottom should be compacted to at least 90 percent relative compaction in accordance with the latest version of ASTM Test Method D1557 and then evaluated and approved by Twining. However, the scarification and re-compaction may not be performed, if the bottom is firm and consists of undisturbed native soils and the relative compaction is tested at least 90%, in which case, the bottom should be rolled, and measures should be taken to prevent subgrade disturbance.

Fill and backfill materials should be compacted fill in accordance with Sections 6.4.5 and 6.4.6 of this report. Prior to placement of any fill, the geotechnical engineer or their representative should review the bottom of the excavation for conformance with the recommendations of this report.

6.4.5. Materials for Fill

In general, on-site soils expected to be excavated consist of lean clay with varying amounts of fines and a very low expansion potential and are considered suitable for use as fill. All fill soils should be free of organics, debris, rocks or lumps over three inches in largest dimension, other deleterious material, and not more than 40 percent larger than $\frac{3}{4}$ inch. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or may be disposed of offsite.

Any imported fill material should consist of granular soil having a "very low" expansion potential (i.e., expansion index of 20 or less). Import material should also have low corrosion potential (that is, chloride content less than 500 parts per million [ppm], soluble sulfate content of less than 0.1 percent, and pH of 5.5 or higher).

All fill soils should be evaluated and approved by a Twining representative prior to importing or filling.

6.4.6. Compacted Fill

Unless otherwise recommended, the exposed excavation bottom to receive fill should be prepared in accordance with Section 6.4.4 of this report. Prior to placement of compacted fill, the contractor should request Twining to evaluate the exposed excavation bottoms.

Compacted fill should be placed in horizontal lifts of approximately 8 to 10 inches in loose thickness, depending on the equipment used. Prior to compaction, each lift should be moisture conditioned, mixed, and then compacted by mechanical methods. The moisture content should be approximately 2 percent above the optimum moisture content. Fill materials should be compacted to a minimum relative compaction of 95 percent within the upper one foot below new vehicle trafficked pavement sections, and 90 percent in all other areas, unless indicated otherwise. The relative compaction should be determined by ASTM D1557. Successive lifts should be treated in the same manner until the desired finished grades are achieved.

6.4.7. Excavation Bottom Stability

Recommendations for stabilizing excavation bottoms should be based on evaluation in the field by the geotechnical consultant at the time of construction. In general, we anticipate that bottoms of the excavations will be stable and should provide suitable support for the proposed improvements. Conditions of the excavation bottom should be evaluated by Twining during the scarification and re-compaction efforts. Soft bottom conditions can be identified by surface yielding under rubber-tired equipment loading and the inability to achieve proper compaction. Recommendations for stabilizing excavation bottoms should be based on evaluation in the field by the geotechnical consultant at the time of construction.

6.4.8. Backfill for Utility Trench

When adjacent to any footings, utility trenches and pipes should be laid above an imaginary 1:1 (H:V) line projected down from the closest bottom edges of any footings. Otherwise, the pipe should be encased as described in Section 6.4.2 to accept the lateral effect from the footing load.

Utility trench excavations to receive backfill should be free of trash, debris or other unsatisfactory materials at the time of backfill placement. At locations where the trench bottom is yielding or otherwise unstable, pipe support may be improved by placing a minimum 6 inches of bedding materials. Remedial earthwork at the trench bottom should be performed where oversized materials (rocks or clods greater than 3 inches) are present. Removal of oversized materials to a depth of 6 inches below the bottom of the pipeline and replacement with fill material compacted to at least 90% relative compaction is recommended. The trench should be backfilled with bedding material extending to at least one foot over the top of pipe. The bedding material should be placed over the full width of the trench. After placement of the pipe, the bedding should be brought up uniformly on both sides of the pipe to reduce the potential for unbalanced loads. No void or uncompacted areas should be left beneath the pipe haunches.

The bedding materials may consist of clean sand having a minimum sand equivalent (SE) of 30, crushed rock, or 2-sack sand-cement slurry, and should meet the specifications provided in the latest edition of the "Greenbook" Standard Specifications for Public Works Construction. Samples of materials proposed for use as bedding material should be provided to the project geotechnical engineer for inspection and testing before the material is imported for use on the project. The onsite materials can only be used following the requirement of "Greenbook" bedding specification when the SE is not less than 30.

Above pipe bedding, trench backfill may be onsite soils and should not contain rocks or lumps over 3 inches in largest dimension. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or may be disposed offsite. The moisture content should be approximately 2 percent above the optimum moisture content. However, within the upper 12 inches of subgrade in areas of concrete slabs-on-grade, concrete pavement, and concrete flatwork, trench backfill should not consist of onsite soils with expansion potential greater than 20.

Backfill may be placed and compacted by mechanical means and should be compacted to 90 percent of the laboratory maximum dry density as per ASTM Standard D1557. Within pavement areas, the upper 12 inches of subgrade soils and the overlying aggregate base should be compacted to 95 percent.

Jetting or flooding of pipe bedding and backfill material is not recommended.

6.4.9. Rippability

The earth materials underlying the site should be generally excavatable with heavy-duty earthwork equipment in good working condition. Some gravels, cobbles and man-made debris should be anticipated.

6.4.10. Construction Dewatering

As discussed earlier, not groundwater was encountered to the maximum exploration depth of approximately 81.5 feet. Construction of the project is anticipated to occur above the groundwater. The possibility to encounter groundwater is low during earthwork and foundation preparation for the proposed structures, and the need for dewatering is not anticipated for construction of foundations and utility trenches.

If needed, considerations for construction dewatering should include anticipated drawdown, volume of pumping, potential for settlement of nearby structures, and groundwater discharge. Disposal of groundwater should be performed in accordance with guidelines of the Regional Water Quality Control Board.

6.4.11. Soil Export

In case the project generates excess soil in need of export from the site, evaluating the environmental quality of soil to be exported should be considered to protect the liability of both the sending and receiving parties. Environmental quality of the export soils could significantly affect soil export costs. Considering the potential liability, it is generally good practice to sample the soil that is planned for export regardless of the findings of a Phase I Environmental Site Assessment (ESA) and/or Preliminary Assessment (PA). Due diligence and project planning are key to managing costs associated with the export of soil. A qualified environmental professional should be consulted to assist with these efforts since each site is unique.

6.5. Foundation Recommendations for Proposed Building

Based upon the excavation/over-excavation and backfill recommendations, the proposed building may be supported on continuous strip footings or isolated footings designed in accordance with the geotechnical recommendations presented below. Structural design of foundations should be performed by the structural engineer and should conform to the 2019 California Building Code.

6.5.1. Bearing Capacity and Settlement

Proposed new footings for the building should be placed on the subgrade prepared in accordance with the requirements for the building pad as described in Section 6.4. The building load information is not currently available for our review. Based on our experience with similar projects, it is assumed that the maximum load will not exceed 150 kilo-pounds (kips) on isolated footings and 20 kips per foot on continuous footing. Geotechnical parameters presented in Table 5 may be used in the footing design. Twining should be contacted for footing dimensions, allowable bearing pressures, and settlements that are outside the indicated applicable ranges.

6.5.2. Lateral Resistance

Lateral loads may be resisted by footing base friction and by the passive resistance of the soils based on recommendations provided in Table 5. The total lateral resistance can be taken as the

sum of the friction at the base of the footing and passive resistance. The upper one foot of soil should be neglected when calculating the passive resistance.

Table 5 - Geotechnical Design Parameters for Shallow Foundations

Minimum Footing Dimensions	<ul style="list-style-type: none"> • <u>Width</u>: 24 inches for square footings and 18 inches for continuous footings. • <u>Minimum embedment</u>: 24 inches measured from the lowest adjacent grade to the bottom of the footing. • <u>Minimum thickness</u>: 6 inches
Net Allowable Bearing Pressure	<ul style="list-style-type: none"> • Footings should all bear on at least 2 feet of engineered fill or all directly on undisturbed competent native soils. • Allowable bearing pressures of 3,000 and 4,000 pounds per square foot (psf) may be used for continuous and square footings, respectively. • The allowable bearing values may be increased by one-third for transient loads from wind or earthquake.
Estimated Static Settlement	<ul style="list-style-type: none"> • Approximately one inch of total settlement with differential settlement on the order of ½ inches over 30 feet for similarly loaded footings.
Allowable Coefficient of Friction Below Footings	0.3
Allowable Lateral Passive Resistance	<ul style="list-style-type: none"> • 240 pcf (equivalent fluid pressure), to a maximum pressure of 3,600 psf. • The upper one foot of soil should be neglected when calculating the passive resistance. • The allowable passive resistance value may be increased by one-third for transient loads such as wind or earthquake loads.

6.6. Foundation Recommendations for Minor Structures

Proposed minor structures structurally separated from the building may be supported on continuous strip footings or isolated footings designed in accordance with the geotechnical recommendations presented below. Structural design of foundations should be performed by the structural engineer and should conform to the 2019 CBC.

6.6.1. Bearing Capacity and Settlement

Proposed minor structures placed on subgrade prepared in accordance with the requirements as described in Section 6.4 may be designed using the geotechnical parameters presented in Table 6.

6.6.2. Lateral Resistance

Lateral loads may be resisted by footing base friction and by the passive resistance of the soils based on recommendations provided in Table 6. The total lateral resistance can be taken as the sum of the friction at the base of the footing and passive resistance.

Table 6 - Geotechnical Design Parameters for Shallow Foundations for Minor Structures

Minimum Footing Dimensions	<ul style="list-style-type: none"> • <u>Width</u>: 12 inches. • <u>Minimum embedment</u>: 12 inches measured from the lowest adjacent grade to the bottom of the footing. • <u>Minimum thickness</u>: 6 inches
Allowable Bearing Pressure	<ul style="list-style-type: none"> • An allowable bearing pressure of 1,500 psf may be used. • The allowable bearing values may be increased by one-third for transient loads from wind or earthquake.
Estimated Static Settlement	<ul style="list-style-type: none"> • Approximately one inch of total settlement with differential settlement on the order of ½ inches over 50 feet for similarly loaded footings. • The static settlement of the foundation system is expected to complete on initial application of loading.
Allowable Coefficient of Friction Below Footings	0.25.
Allowable Lateral Passive Resistance	<ul style="list-style-type: none"> • 100 pcf (equivalent fluid pressure), up to 1,500 psf. • The upper one foot of soil should be neglected when calculating the passive resistance. • The allowable passive resistance value may be increased by one-third for transient loads such as wind or earthquake loads.

6.7. Below-Grade Walls

For walls below grade, recommendations for wall lateral loads, backfill, and drainage are provided below. Foundation excavation, bearing capacity and lateral resistance for below-grade walls may be based on recommendations for the building provided in Sections 6.4 and 6.5 of this report. Below-grade walls should be designed to have a factor of safety of 1.5 for static stability and 1.1 for stability due to transient loads from wind or seismic.

6.7.1. Backfill and Drainage of Walls

The backfill material behind walls should consist of granular non-expansive material and be approved by the project geotechnical engineer. Based on the soil materials encountered during our exploration, most on-site soils will meet this requirement.

Wall backfill should be adequately drained. Adequate backfill drainage is essential to provide a free-drained backfill condition and to limit hydrostatic buildup behind walls. Drainage behind walls may be provided by a geosynthetic drainage composite such as TerraDrain, MiraDrain, or equivalent, attached to the outside perimeter of the wall and installed in accordance with the manufacturer's recommendations. The drainage system should meet the minimum requirements of Sections 1805.4.2 and 1805.4.3 of 2019 CBC.

In addition, walls sensitive to moisture buildup on the interior sides due to water migration from soils touching the walls should have appropriate waterproofing applied for the full height of the walls and meeting the minimum requirements of Section 1805.3 of 2019 CBC.

6.7.2. Lateral Earth Pressure

The values presented below assume that the supported grade is level, and Twining should be contacted for sloping backfill conditions. The recommended design lateral earth pressure is calculated assuming that a drainage system will be installed behind retaining walls in accordance with Sections 1805.4.2 and 1805.4.3 of 2019 CBC and that external hydrostatic pressure will not develop behind the walls. Where wall backfill does not have adequate drainage, the full hydrostatic pressure should be added to the lateral earth pressures provided below in design.

Walls that are free to move and rotate at the top (such as cantilevered walls) and have adequate drainage may be designed for the active earth pressure equivalent to a fluid weighing 38 pcf, if height of retained soil is no more than 15 feet.

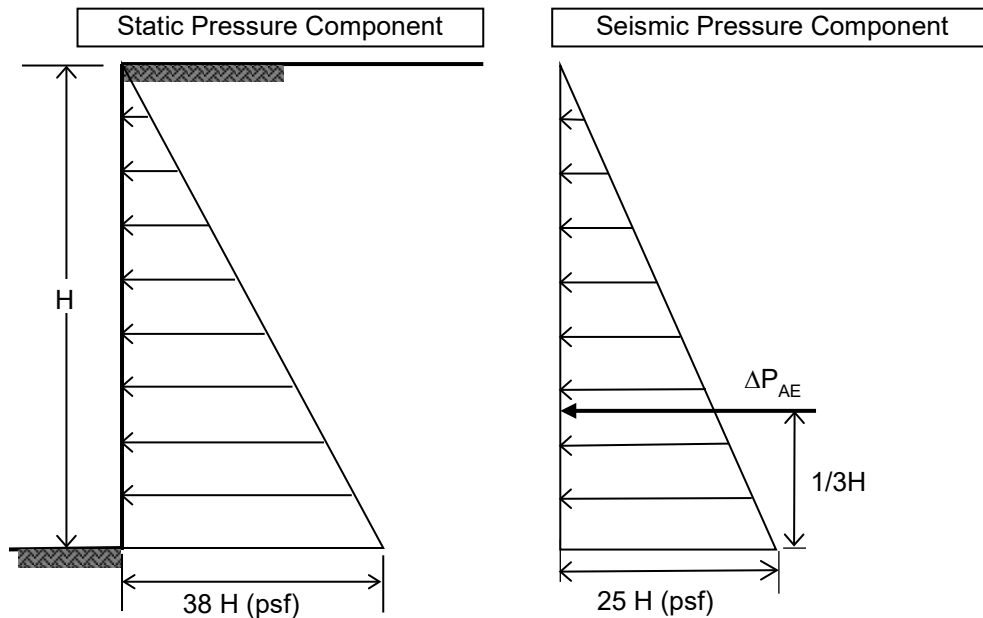
Walls that are restricted to move horizontally at the top (such as by a floor deck) and have adequate drainage may be designed for the "at-rest" earth pressure equivalent to a fluid weighing 72 pcf.

Vertical surcharge loads within a 1:1 plane projected from the bottom of the wall distributed over retained soils should be considered as additional uniform horizontal pressures acting on the wall. These additional pressures can be estimated as approximately 41% and 58% of the magnitude of the vertical surcharge pressures for the "active" and "at-rest" conditions, respectively.

6.7.3. Seismic Lateral Earth Pressure

Walls retaining more than 6 feet high earth should be designed for seismic lateral earth pressure. The seismic pressure distribution may be considered a triangle with the maximum pressure at

the bottom. We estimated the seismic earth pressure increment for walls retaining level ground based on Seed and Whitman (1970) and a horizontal seismic coefficient (k_h) equivalent to one-half of two-thirds of PGA_M provided in Table 1. The following combination of static and incremental seismic pressures shown in the following diagram may be used for seismic design for both cantilever and restrained walls.



where H is in feet and is no more than 15 feet.

Diagram 1 - Seismic Earth Pressure Distribution on Walls

6.8. Modulus of Subgrade Reaction

The modulus of subgrade reaction k for combined footing design and slabs-on-grade may be obtained from the following equation.

$$K = \frac{k_1}{B} \left(\frac{2L + B}{3L} \right)$$

where: k_1 = modulus for a 1-foot by 1-foot plate = 100 pounds per cubic inch (pci);
 B = width of combined footing or slab in feet; and
 L = length of combined footing or slab in feet.

6.9. Pole Foundations

Pole foundations for flagpoles, fences, and signposts may be designed using an allowable skin friction of 450 psf, and an allowable end bearing resistance of 4,000 psf. This value may be increased by 33 percent for seismic or transient wind load. The upper 2 feet of the foundation frictional resistance should be neglected.

Lateral resistance for conditions with and without lateral constraint provided at the ground surface conditions are provided below based on 2019 CBC.

6.9.1. Non-Constrained Ground

The embedment of pole foundations where no lateral constraint is provided at or above the ground surface should be calculated using Equation 18-1 of 2019 CBC (shown below) or a minimum 3 feet below the ground surface, whichever is deeper.

$$D = \frac{A}{2} \left(1 + \sqrt{1 + \frac{4.36h}{A}} \right) \quad (\text{Equation 18-1 of 2019 CBC})$$

where:

A = $2.34P/(S_1 \cdot b)$

b = Diameter of round post or footing or diagonal dimension of square post or footing, feet

d = Depth of embedment in earth in feet but not over 12 feet for purpose of computing lateral pressure.

H = Distance in feet from ground surface to point of application of "P".

P = Applied lateral force in pounds.

S₁ = Allowable lateral soil-bearing pressure based on a depth of one-third the depth of embedment in psf.

An allowable passive earth pressure of 240 pcf up to a maximum of 3,600 psf may be used for design provided the upper one foot of passive resistance is neglected in the structural design. Pole foundations spaced at least 3 diameters of the maximum pole foundation may be designed using an allowable lateral resistance equal to 2 times of the allowable passive pressure.

6.9.2. Constrained Ground

The embedment of pole foundations where lateral constraint is provided at the ground surface, such as by a rigid floor or pavement, should be calculated using Equation 18-2 of 2019 CBC (shown below) or a minimum 3 feet below the ground surface, whichever is deeper.

$$D = \sqrt{\frac{4.25Ph}{S_3b}} \quad (\text{Equation 18-2 of 2019 CBC})$$

where:

b = Diameter of round post or footing or diagonal dimension of square post or footing, feet

d = Depth of embedment in earth in feet but not over 12 feet for purpose of computing lateral pressure.

H = Distance in feet from ground surface to point of application of "P".

P = Applied lateral force in pounds.

S_3 = Allowable lateral soil-bearing pressure based on a depth of one-third the depth of embedment in psf.

An allowable passive earth pressure of 240 pcf up to a maximum of 3,600 psf may be used for design provided the upper one foot of passive resistance is neglected in the structural design. Pole foundations spaced at least 3 diameters of the maximum pole foundation may be designed using an allowable lateral resistance equal to 2 times of the allowable passive pressure.

6.10. Concrete Slabs

Slabs should be supported on non-expansive engineered fill in accordance with Section 6.4 of this report. For design of concrete slabs, the subgrade modulus k calculated from the equation in Section 6.8 may be used.

Floor slabs should be designed and reinforced in accordance with the structural engineer's recommendations. However, for slabs not supporting heavy loads, we recommend that the concrete should have a thickness of at least 4 inches, a 28-day compressive strength of at least 3,000 pounds per square inch (psi), a water-cement ratio of 0.50 or less, and a slump of 4 inches or less. Slabs should be reinforced with at least No. 3 reinforcing bars placed longitudinally at 18 inches on center. The reinforcement should extend through the control joints to reduce the potential for differential movement. Control joints should be constructed in accordance with recommendations from the structural engineer or architect. For slabs supporting equipment, a minimum thickness of 5 inches is recommended. Additional thickness and reinforcement recommendations may be provided by the structural engineer.

The topmost 8 inches below the slab subgrade should be maintained in a moisture condition of approximately 0 to 2 percent above optimum moisture content. The slab subgrade should be tested for moisture and compaction immediately prior to placement of the gravel or sand base, if any. All underslab materials should be adequately compacted prior to the placement of concrete. Care should be taken during placement of the concrete to prevent displacement of the underslab materials. The underslab material should be dry or damp and should not be saturated prior to the placement of concrete. The concrete slab should be allowed to cure properly and should be tested for moisture transmission prior to placing vinyl or other moisture-sensitive floor covering. In moisture sensitive areas, the floor slabs should be dampproofed in accordance with Section 1805A.2 of 2019 CBC. Specific recommendations can be provided by a waterproofing consultant.

Table 7 provides general recommendations for various levels of protection against vapor transmission through concrete floor slabs placed over a properly prepared subgrade. Care should be taken not to puncture the plastic membrane during placement of the membrane itself and the overlying silty sand.

The above recommendations are intended to reduce the potential for cracking of slabs; however, even with the incorporation of the recommendations presented herein, slabs may still exhibit some cracking. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics.

Table 7 - Options for Subgrade Preparation below Concrete Floor Slabs

Primary Objective	Recommendation
Enhanced protection against vapor transmission	<ul style="list-style-type: none"> • Concrete floor slab-on-grade placed directly on a 15-mil-thick moisture vapor retarder that meets the requirements of ASTM E1745 Class C (Stego Wrap or similar) • The moisture vapor retarder membrane should be placed directly on the subgrade (ACI302.1R-67); if required for either leveling of the subgrade or for protection of the membrane from protruding gravel, then place about 2 inches of silty sand¹ under the membrane
Above-standard protection against vapor transmission	<p>This option is available if the slab perimeter is bordered by continuous footings at least 24 inches deep, OR if the area adjacent and extending at least 10 feet from the slab is covered by hardscape without planters:</p> <ul style="list-style-type: none"> • 2 inches of dry silty sand¹; over • Waterproofing plastic membrane 10 mils in thickness; over • At least 4 inches of ¾-inch crushed rock² or clean gravel³ to act as a capillary break
Standard protection against vapor transmission	<ul style="list-style-type: none"> • 2 inches of dry silty sand¹; over • Waterproofing plastic membrane 10 mils in thickness • If required for either leveling of the subgrade or for protection of the membrane from protruding gravel, place at least 2 inches of silty sand¹ under the membrane.
<p>Notes:</p> <p>¹ The silty sand should have a gradation between approximately 15 and 40 percent passing the No. 200 sieve and a plasticity index of less than 4.</p> <p>² The ¾-inch crushed rock should conform to Section 200-1.2 of the latest edition of the "Greenbook" Standard Specifications for Public Works Construction (Public Works Standards, Inc., 2012).</p> <p>³ The gravel should contain less than 10 percent of material passing the No. 4 sieve and less than 3 percent passing the No. 200 sieve.</p>	

6.11. Temporary Shoring

If the project involves excavations that lack sufficient space for sloped excavations, cantilevered shoring or braced- or tieback shoring should be considered and designed.

For vertical excavations less than approximately 15 feet in height, cantilevered shoring may be used. Where cantilevered shoring is used for deeper excavations, the total deflection at the top of the wall tends to exceed acceptable magnitudes. Shoring of excavations deeper than approximately 15 feet should be accomplished with the aid of internal bracing or tieback earth anchors.

The shoring design should be provided by a California Registered Civil Engineer experienced in the design and construction of shoring under similar conditions. Once the final excavation and shoring plans are complete, the plans and the design should be reviewed by Twining Laboratories for conformance with the design intent and recommendations. Further, the shoring system should satisfy applicable requirements of CalOSHA.

6.11.1. Lateral Earth Pressures

For design of cantilevered shoring for excavations less than 15 feet in height, a triangular distribution of lateral earth pressure may be used. It may be assumed that the drained soils, with a level surface behind the cantilevered shoring, will exert an equivalent fluid pressure of 38 pcf.

For the design of braced- or tieback-shoring, a rectangular pressure distribution where the pressure may be used. The design pressure should be $25H$ psf, where H is the retained soil height in feet.

Any surcharge (live, including traffic, or dead load) located within a 1:1 plane projected upward from the base of the shored excavation, including adjacent structures, should be added to the lateral earth pressures. The lateral contribution of a uniform surcharge load located immediately behind the temporary shoring may be calculated by multiplying the vertical surcharge pressure by 41% for cantilevered shoring and 58% for braced- or tieback- shoring. Lateral load contributions of surcharges located at a distance behind the shored wall may be provided once the load configurations and layouts are known. As a minimum, a 250 psf vertical uniform surcharge is recommended to account for nominal construction and/or traffic loads. More detailed lateral pressure and loading information can be provided, if needed, for specific loading scenarios as recognized through the design process.

6.11.2. Soldier Pile Design

The soldier piles for support of shoring should be designed in accordance with the geotechnical parameters presented in Table 8. Soldier piles should be spaced no closer than $3D$ on center, where D is the diameter of the drilled shaft for the soldier piles. Soldier piles may consist of either cast-in-place concrete caissons or pre-drilled steel beams encased in concrete (below the bottom of the excavation) and slurry (above the bottom of the excavation).

Table 8 - Geotechnical Design Parameters for Soldier Piles

The allowable lateral resistance of an isolated soldier pile drilled into the on-site soils can be calculated using equivalent fluid pressure (EFP)	240 pcf
Increase (multiplier) of the allowable lateral passive resistance due to arching (this value is applicable for soldier piles that are spaced no closer than 3 diameters)	2

The downward component of a tieback anchor load transferred to the soldier pile may be supported by frictional resistance between the soldier piles and the retained earth, and the skin friction of the pile shaft below finished excavation grade. The allowable frictional resistance between the soldier piles and the retained earth may be taken as 200 psf. The allowable downward capacity of a soldier pile below the excavated level may be estimated using an average allowable unit skin friction of 25 psf per foot below bottom of excavation. This allowable unit skin friction incorporates a factor of safety of 1.5. The upper 1.5D should be neglected when calculating the axial capacity below the excavated level.

Continuous timber lagging should be used between the soldier piles. If treated timber is used, the lagging may remain in place. To develop the full lateral resistance, provisions should be taken to assure firm contact between the soldier piles and the soils; for this, we recommend that 1-½-sack sand-cement slurry infill behind the lagging be used. For drilled piles, we recommend that piles adjacent to one another be drilled alternately on different days to minimize disturbance to the open excavations.

Drilling of soldier pile shafts can be accomplished using conventional drilling equipment. Caving should be anticipated where layers of clean sand or silty sand occurs. In the event of soil caving, it may be necessary to use casing and/or drilling mud to permit the installation of the soldier piles. Drilled holes for soldier piles should not be left open overnight. Concrete for piles should be placed immediately after the drilling of the hole and placement of the steel pile (or rebar cage) is complete. The concrete should be pumped to the bottom of the drilled shaft using a tremie. Once concrete pumping is initiated, the bottom of the tremie should remain below the surface of the concrete to prevent contamination of the concrete by soil inclusions. If steel casing is used, the casing should be removed as the concrete is placed. The concrete placed in the soldier pile excavations may be a lean mix concrete above the elevation of the bottom of the excavation. However, the concrete that is placed in the portion of the soldier pile that is below the deepest planned excavated level should have a minimum 28-day compressive strength of at least 2,500 psi. The contractor may also consider the use of driven piles or piles that are vibrated into place in lieu of drilled piles to address potential issues related to caving of drilled shafts.

6.11.3. Tieback Design

Excavations deeper than 15 feet may require tieback anchors to be used to resist lateral loads. For design purposes, it may be assumed that the failure wedge adjacent to the shoring is defined by a plane projected up at approximately 30 degrees from the vertical from the toe of the wall. The anchors should extend at least 15 feet beyond the potential failure wedge; however, the shoring engineer should evaluate the bonded length required beyond the failure wedge based on the loading on the shoring and the allowable skin friction provided. The bonded length should commence no less than 3 feet beyond the failure wedge.

We recommend using a soil/anchor bond friction of 450 psf along the anchors in the bonded zone. Only friction developed beyond the active wedge should be considered when determining the tieback resistance. If the anchors are spaced at least 6 feet on center, no reduction in the capacity of the anchors need be considered due to group action.

As the tieback shoring system is intended for temporary use, provisions should be made in the design to de-tension and abandon the tiebacks when the subgrade walls are able to support the lateral loads.

6.11.4. Anchor Installation

The anchors may be installed at angles of 15 to 30 degrees below the horizontal. Caving may occur during the drilling of tiebacks if loose cohesionless materials are encountered. The contractor should implement appropriate measures to stabilize the drilled hole such as the installation of steel casing for loose cohesionless materials or the use of drilling mud. The anchors should be filled with concrete placed by pumping from the tip out. The portion of the anchor tendons within the failure wedge should be sleeved in plastic. If the anchor tendons are sleeved, it is acceptable to grout the entire length of the anchor.

6.11.5. Lagging and Sheeting

Continuous lagging will be required between the soldier piles. The soldier piles and anchors should be designed for the full anticipated lateral pressure. However, where lagging is relatively flexible to wales or soldier beams, the pressure on the lagging will be less due to arching in the soils. We recommend that the lagging be designed for a semi-circular distribution of earth pressure where the maximum pressure is 500 psf at the mid-line between soldier piles, and 0 psf at the soldier piles.

6.11.6. Lateral Deflection and Settlement

Excessive deflection could result in settlement or undermining of surrounding structures. Shoring should be adequately designed, installed, and monitored to limit the amount of lateral deflection of the shoring system and settlement behind the shoring to the allowable values of adjacent structures and improvements. The amount of deflection of the shoring system and the allowable deflections and settlements should be determined by the shoring designer. The allowable deflections and settlements should be based on the proximity of adjacent structures and improvements and the potential negative effects on those structures. If it is desired to reduce the deflection, a greater lateral pressure could be used in shoring design. If greater than anticipated deflection occurs during construction, additional bracing or tiebacks may be necessary to minimize deflection of existing adjacent improvements.

Settlement of structures or facilities founded adjacent to the shoring will occur in proportion to both the distance between the shoring and the facilities, and the amount of horizontal deflection of the shoring system. The vertical settlement will be a maximum at the shoring face and decrease as the horizontal distance from the shoring increases. Beyond a distance from the shoring equal to the height of the shoring, the settlement is expected to be negligible. The maximum vertical settlement is expected to be about 75 percent of the maximum horizontal deflection on top of the shoring system.

6.11.7. Monitoring

For excavations in close proximity to existing improvements, some means of monitoring the performance of the shoring system is recommended. Monitoring should consist of periodic surveying of lateral and vertical locations at the tops of all soldier piles. We will be pleased to discuss this further with the design consultants and the contractor when the design of the shoring system has been finalized.

6.12. Pavement Recommendations

Pavement section should be constructed on top of properly prepared subgrade in accordance with Section 6.4 of this report and aggregate base (AB) section compacted to 95 percent of the maximum dry density in accordance with ASTM D1557.

We performed laboratory R-value testing for preliminary pavement section design. The test indicates an R value of 10, which was used in our pavement structural calculations. Sections 6.12.1 and 6.12.2 present our recommendations for preliminary design of flexible and rigid pavement sections, respectively. Final pavement design should be based on field observations, additional R-value tests during construction should the materials exposed differ than what is expected based on our field exploration, and the anticipated traffic index as determined by the project civil engineer.

6.12.1. Flexible Pavement Design

Our flexible pavement structural design is in accordance with Chapter 630 of the Caltrans Highway Design Manual, which is based on a relationship between the gravel equivalent (GE) of the pavement structural materials, the traffic index (TI), and the R-value of the underlying subgrade soil. For preliminary design of flexible pavement section, Table 9 provides recommended minimum thicknesses for hot mix asphalt (HMA) and aggregate base sections for different traffic indices.

Table 9 – Recommended Minimum HMA and Base Section Thicknesses

Traffic Index	5.0	6.0	7.0
HMA Thickness (in)	4	5	6
Aggregate Base Thickness (in)	7	9	12

6.12.2. Rigid Pavement Design

For preliminary design of rigid pavement section, Table 10 provides recommended minimum thicknesses for Portland cement concrete (PCC) pavement section and Class 2 Aggregate Base (AB) section for different traffic indices. The recommended values are based on a minimum 28-day concrete compressive strength of 3,500 psi. Positive drainage should be provided away from all pavement areas to prevent seepage of surface and/or subsurface water into the pavement base and/or subgrade.

Table 10 – Recommended Minimum Rigid Pavement Thicknesses

Traffic Index	5.0	6.0	7.0
JPCP Thickness (in)	5	6	7
Aggregate Base Thickness (in)	6	6	6

6.13. Stormwater Infiltration

Percolation testing will be required based on the actual location and depth of the planned system. The design of stormwater infiltration facility should be based on percolation test results with an appropriate reduction factor to account for test method, site variability, and long-term siltation.

For preliminary design of stormwater infiltration devices, we performed percolation testing at the site at two locations at a depth of approximately 5 feet bgs. Details of the percolation tests are presented in Appendix A. Infiltration rates with a reduction factor of 3 from our percolation tests are summarized in Table 11. The results indicate that stormwater infiltration is not feasible at the P-1 and P-2 locations and depth due to the rate being less than the required minimum rate of 0.3 inches per hour. However, based on subsurface conditions encountered in the other borings, additional percolation tests at approximately 15 feet bgs may be performed to study the feasibility of stormwater infiltration at greater depth.

Table 11 – Infiltration Rate with a Reduction Factor of 3

Location	Depth (feet)	Infiltration Rate (in/hour)
P-1	5	0.03
P-2	5	0.04

Proposed infiltration facility should have a minimum setback from property lines and foundations recommended in Table 12. In addition, the bottom of the infiltration facility should be at least 10 feet above the seasonal high groundwater, according to the requirements of Los Angeles County Low Impact Development Standards Manual (2014).

Table 12 – Recommended Minimum Infiltration Facility Setback

Setback from	Distance
Property lines & public right of way	5 feet
Foundations	the greater of 15 feet or a 1:1 plane drawn up from the bottom of foundation
Seasonal high groundwater	10 feet minimum depth from invert of infiltration device
Face of slope	the greater of 5 feet or one half of the slope height
Water wells	100 feet

6.14. Drainage Control

The control of surface water is essential to the satisfactory performance of the building and site improvements. Surface water should be controlled so that conditions of uniform moisture are maintained beneath the improvements, even during periods of heavy rainfall. The following recommendations are considered minimal:

- Ponding and areas of low flow gradients should be avoided.
- If bare soil within 5 feet of the structure is not avoidable, then a gradient of 5 percent or more should be provided sloping away from the improvement. Corresponding paved surfaces should be provided with a gradient of at least 1 percent.
- The remainder of the unpaved areas should be provided with a drainage gradient of at least 2 percent.
- Positive drainage devices, such as graded swales, paved ditches, and/or catch basins should be employed to accumulate and to convey water to appropriate discharge points.
- Concrete walks and flatwork should not obstruct the free flow of surface water.
- Brick flatwork should be sealed by mortar or be placed over an impermeable membrane.
- Area drains should be recessed below grade to allow free flow of water into the basin.
- Enclosed raised planters should be sealed at the bottom and provided with an ample flow gradient to a drainage device. Recessed planters and landscaped areas should be provided with area inlet and subsurface drainpipes.
- Planters should not be located adjacent to the structures wherever possible. If planters are to be located adjacent to the structures, the planters should be positively sealed, should incorporate a subdrain, and should be provided with free discharge capacity to a drainage device.
- Planting areas at grade should be provided with positive drainage. Wherever possible, the grade of exposed soil areas should be established above adjacent paved grades. Drainage devices and curbing should be provided to prevent runoff from adjacent pavement or walks into planted areas.
- Gutter and downspout systems should be provided to capture discharge from roof areas. The accumulated roof water should be conveyed to off-site disposal areas by a pipe or concrete swale system.

Landscape watering should be performed judiciously to preclude either soaking or desiccation of soils. The watering should be such that it just sustains plant growth without excessive watering. Sprinkler systems should be checked periodically to detect leakage and they should be turned off during the rainy season.



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7. DESIGN REVIEW AND CONSTRUCTION MONITORING

Geotechnical review of plans and specifications is of paramount importance in engineering practice. The poor performance of many structures has been attributed to inadequate geotechnical review of construction documents. Additionally, observation and testing of the subgrade will be important to the performance of the proposed development. The following sections present our recommendations relative to the review of construction documents and the monitoring of construction activities.

7.1. Plans and Specifications

The design plans and specifications should be reviewed by Twining, Inc. prior to bidding and construction, as the geotechnical recommendations may need to be reevaluated in light of the actual design configuration and loads. This review is necessary to evaluate whether the recommendations contained in this report and future reports have been properly incorporated into the project plans and specifications. Based on the work already performed, this office is best qualified to provide such review.

7.2. Preconstruction Surveys

We recommend that preconstruction surveys be performed on the adjacent improvements prior to commencement of excavation activities for the subject project. The surveys should include written and photographic (or videographic) documentation of the existing conditions, as well as performance of floor level surveys or establishment of elevation monuments. Documentation of other structures and sensitive instruments within approximately 50 feet of the excavation(s) should also be performed.

7.3. Construction Monitoring

Site preparation, removal of unsuitable soils, assessment of imported fill materials, fill placement, foundation installation, and other site grading operations should be observed and tested, as appropriate. The substrata exposed during the construction may differ from that encountered in the test excavations. Continuous observation by a representative of Twining, Inc. during construction allows for evaluation of the soil conditions as they are encountered and allows the opportunity to recommend appropriate revisions where necessary.



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8. LIMITATIONS

The recommendations and opinions expressed in this report are based on Twining, Inc.'s review of available background documents, on information obtained from field explorations, and on laboratory testing. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site. In the event that any of our recommendations conflict with recommendations provided by other design professionals, we should be contacted to aid in resolving the discrepancy.

Due to the limited nature of our field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations, for example, the extent of removal of unsuitable soil, and that additional effort may be required to mitigate them.

Site conditions, including groundwater elevation, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Twining, Inc. has no control.

Twining's recommendations for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill placement, and foundation construction. Accordingly, the recommendations are made contingent upon the opportunity for Twining to observe grading operations and foundation excavations for the proposed construction. If parties other than Twining are engaged to provide such services, such parties must be notified that they will be required to assume complete responsibility as the geotechnical engineer of record for the geotechnical phase of the project by concurring with the recommendations in this report and/or by providing alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Twining should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report has been prepared for the exclusive use by the client and its agents for specific application to the proposed project. Land use, site conditions, or other factors may change over time, and additional work may be required with the passage of time. Based on the intended use of this report and the nature of the new project, Twining may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release Twining from any liability resulting from the use of this report by any unauthorized party.

Twining performed its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either express or implied, is made as to the conclusions and recommendations contained in this report.

9. SELECTED REFERENCES

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- Saucedo, George J., Gary Greene, Michael P. Kennedy, and Stephen P. Bezore, 2016, Geologic Map of the Long Beach 30' x 60' Quadrangle, California. Version 2.0, Map Scale 1:100,000.
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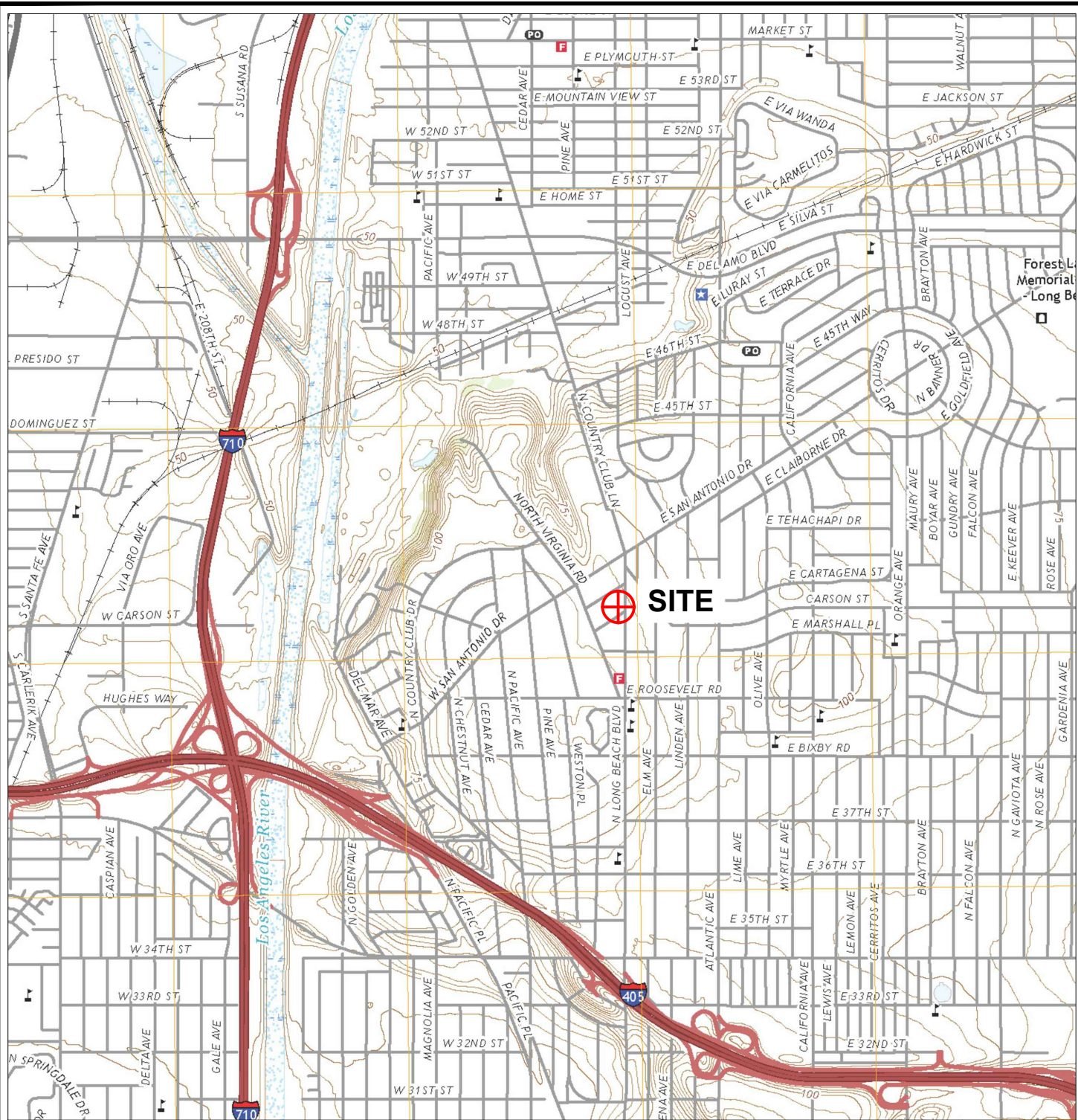
U.S. Geological Survey (USGS), 2018, USGS 1:24000-scale Long Beach Quadrangle, California, 7.5-Minute Series.



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FIGURES



 APPROXIMATE LOCATION OF PROJECT

SCALE IN FEET



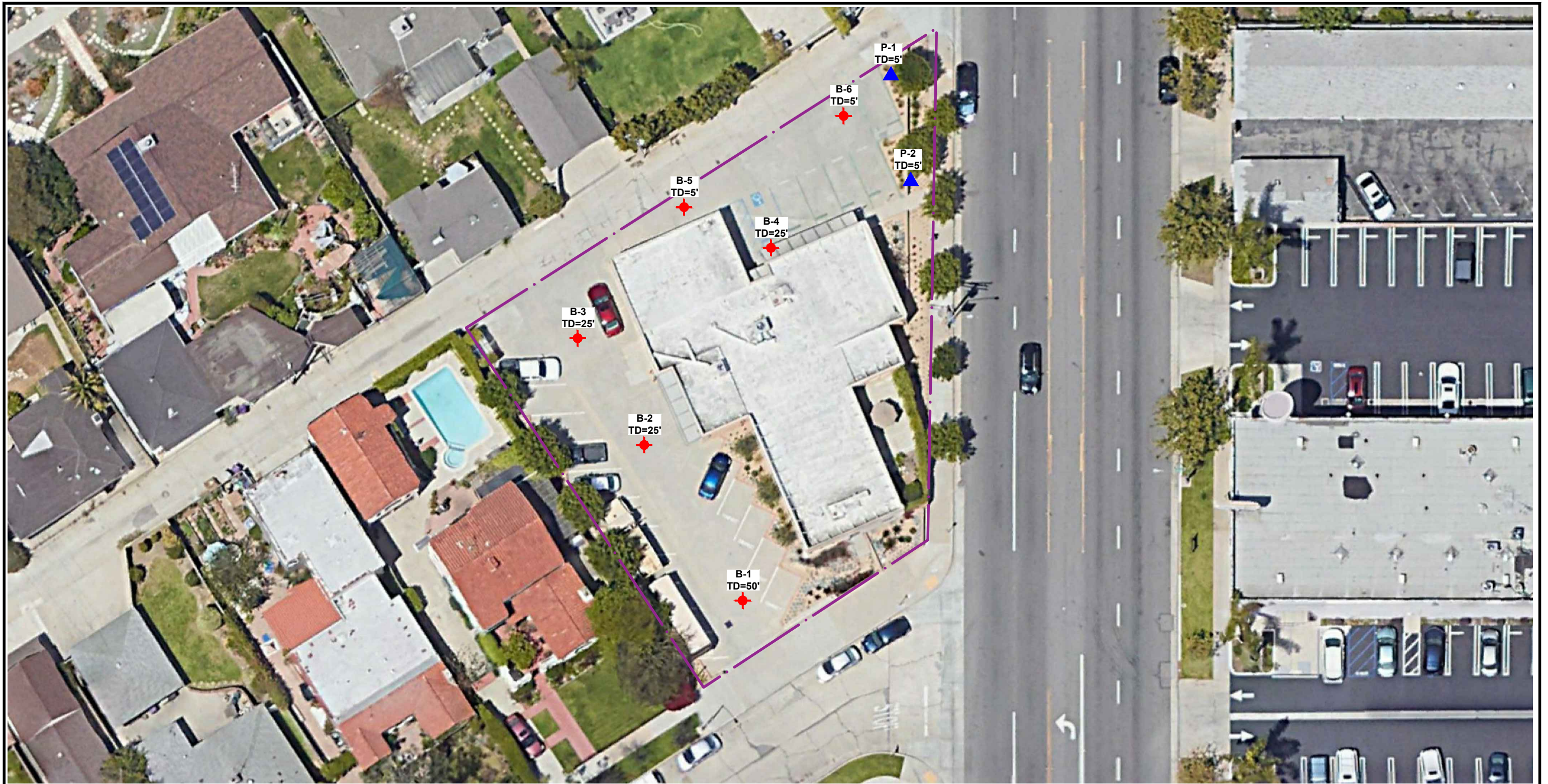
REFERENCE: USGS (2018)



SITE LOCATION MAP

FIRE STATION NO. 9
4101 LONG BEACH BOULEVARD
LONG BEACH, CA

PROJECT NO. 210377.1	REPORT DATE July 2021	FIGURE 1
-------------------------	--------------------------	----------



0 30 60 feet

NOTE: ALL DIMENSIONS AND LOCATIONS ARE APPROXIMATE



TWINING



REFERENCE: GOOGLE EARTH (2021)

LEGEND

B-1
TD=50'



APPROXIMATE LOCATION OF
PROPOSED BORING BY TWINING
TOTAL DEPTH IN FEET

P-1
TD=5'



APPROXIMATE LOCATION OF
PROPOSED PERCOLATION TEST BY TWINING
TOTAL DEPTH IN FEET

— · — · — · — · —
APPROXIMATE LOCATION OF
PROPERTY LINE

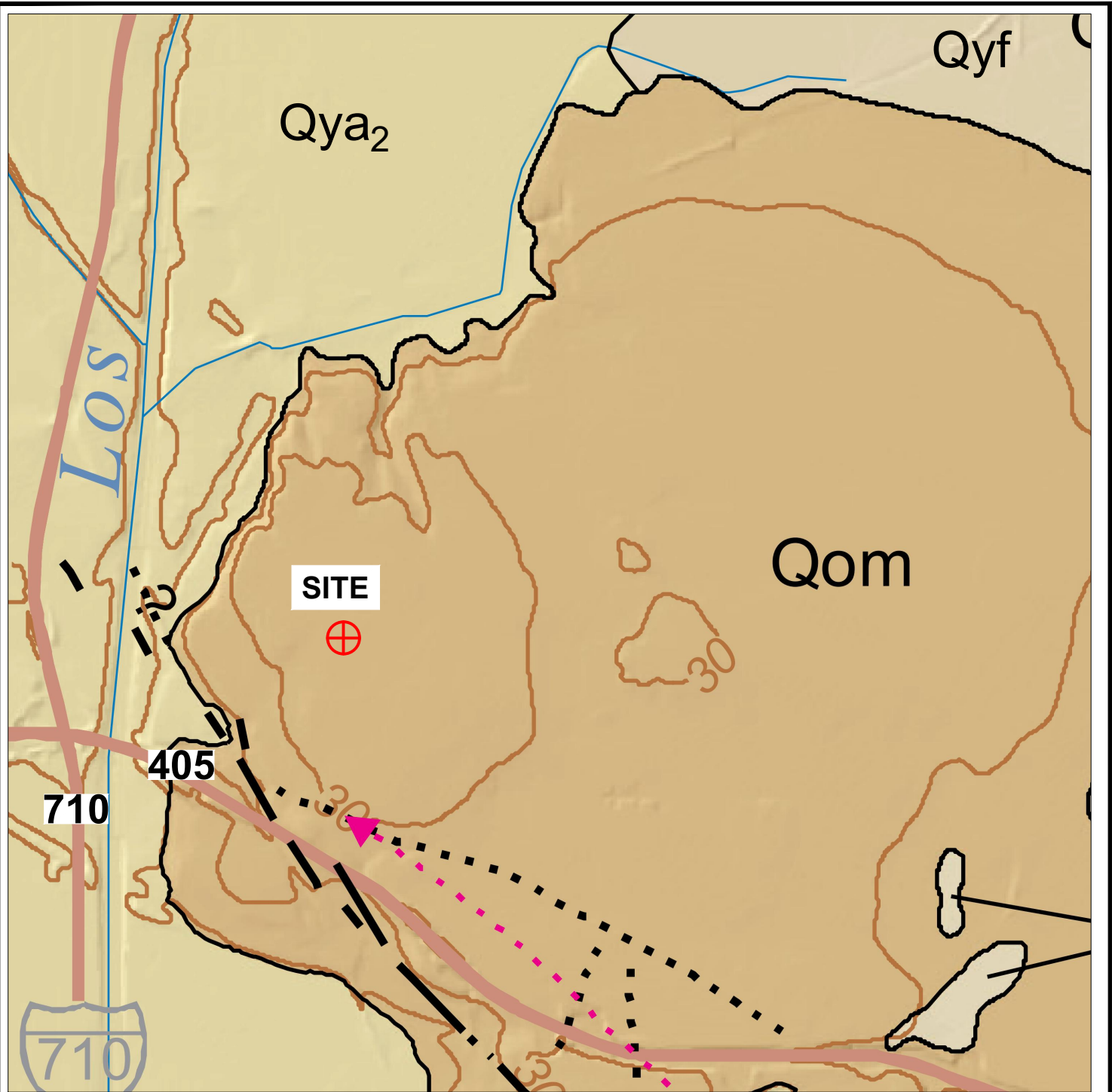
SITE PLAN AND BORING LOCATION MAP

FIRESTATION NO. 9
4101 LONG BEACH BOULEVARD
LONG BEACH, CA

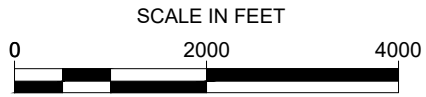
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REPORT DATE
July 2021

FIGURE 2



Qom Old Shallow Marine Deposits on Wave-Cut Surface
Qya2 Young Alluvium
Qyf Young Alluvial Fan Deposits



REFERENCE: SAUCEDO, GREEN, KENNEDY AND BEZORE (2016)



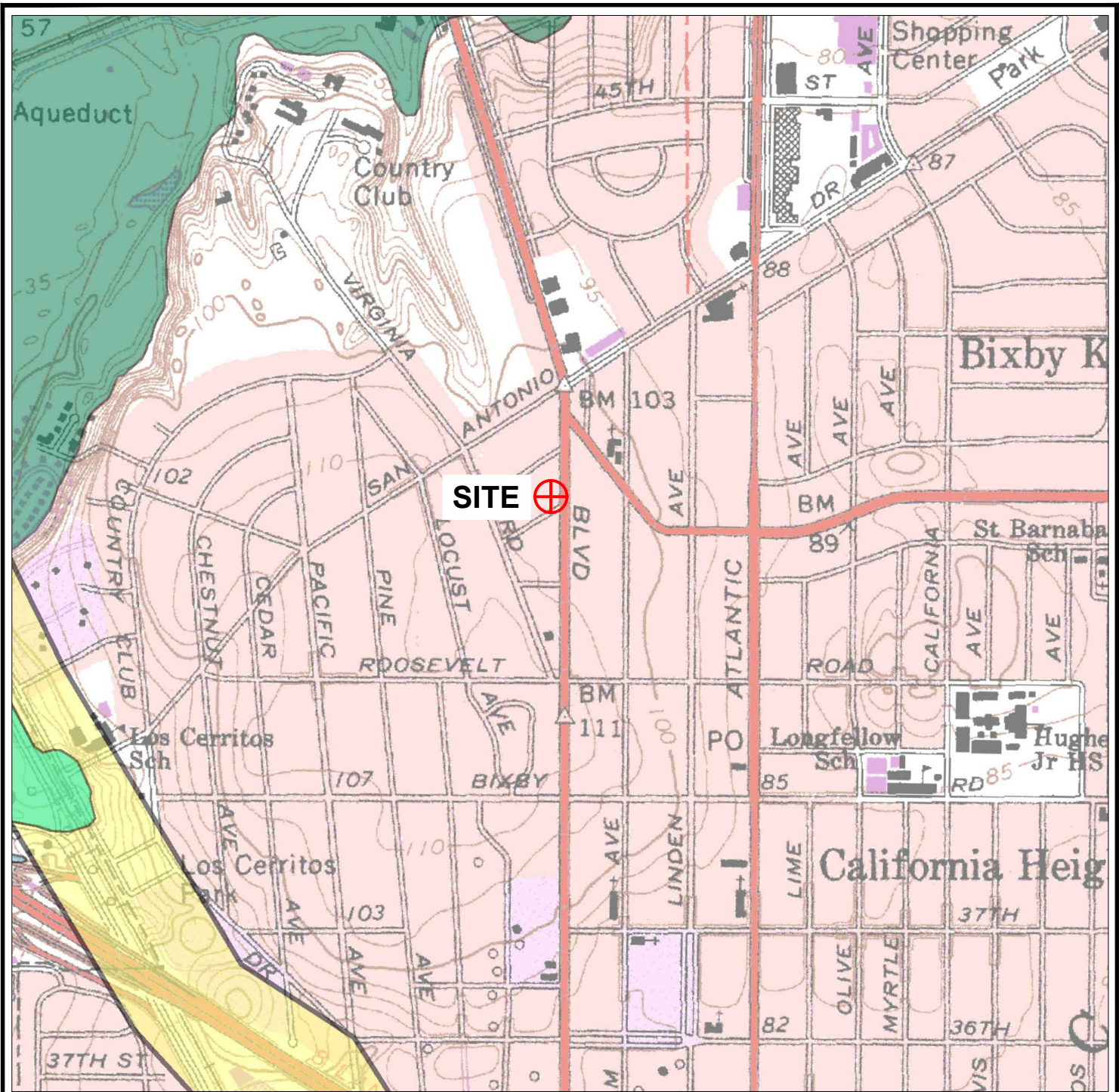
GEOLOGIC MAP

FIRE STATION NO. 9
 4101 LONG BEACH BOULEVARD
 LONG BEACH, CA

PROJECT NO.
 210377.1

REPORT DATE
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FIGURE 3



MAP EXPLANATION

EARTHQUAKE FAULT ZONES

Earthquake Fault Zones
 Zone boundaries are delineated by straight-line segments, the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2521.5(a) would be required.



Active Fault Traces
 Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.



SEISMIC HAZARD ZONES

Liquefaction Zones
 Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.



Earthquake-Induced Landslide Zones
 Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.



OVERLAPPING EARTHQUAKE FAULT AND SEISMIC HAZARD ZONES



Overlap of Earthquake Fault Zone and Liquefaction Zone
 Areas that are covered by both Earthquake Fault Zone and Liquefaction Zone.



Overlap of Earthquake Fault Zone and Earthquake-Induced Landslide Zone
 Areas that are covered by both Earthquake Fault Zone and Earthquake-Induced Landslide Zone.

Note: Mitigation methods differ for each zone – AP Act only allows avoidance; Seismic Hazard Mapping Act allows mitigation by engineering/geotechnical design as well as avoidance.

REFERENCE: CGS (1999)



TWINING

SEISMIC HAZARD ZONES MAP

FIRE STATION NO.9
 4101 LONG BEACH BOULEVARD
 LONG BEACH, CA

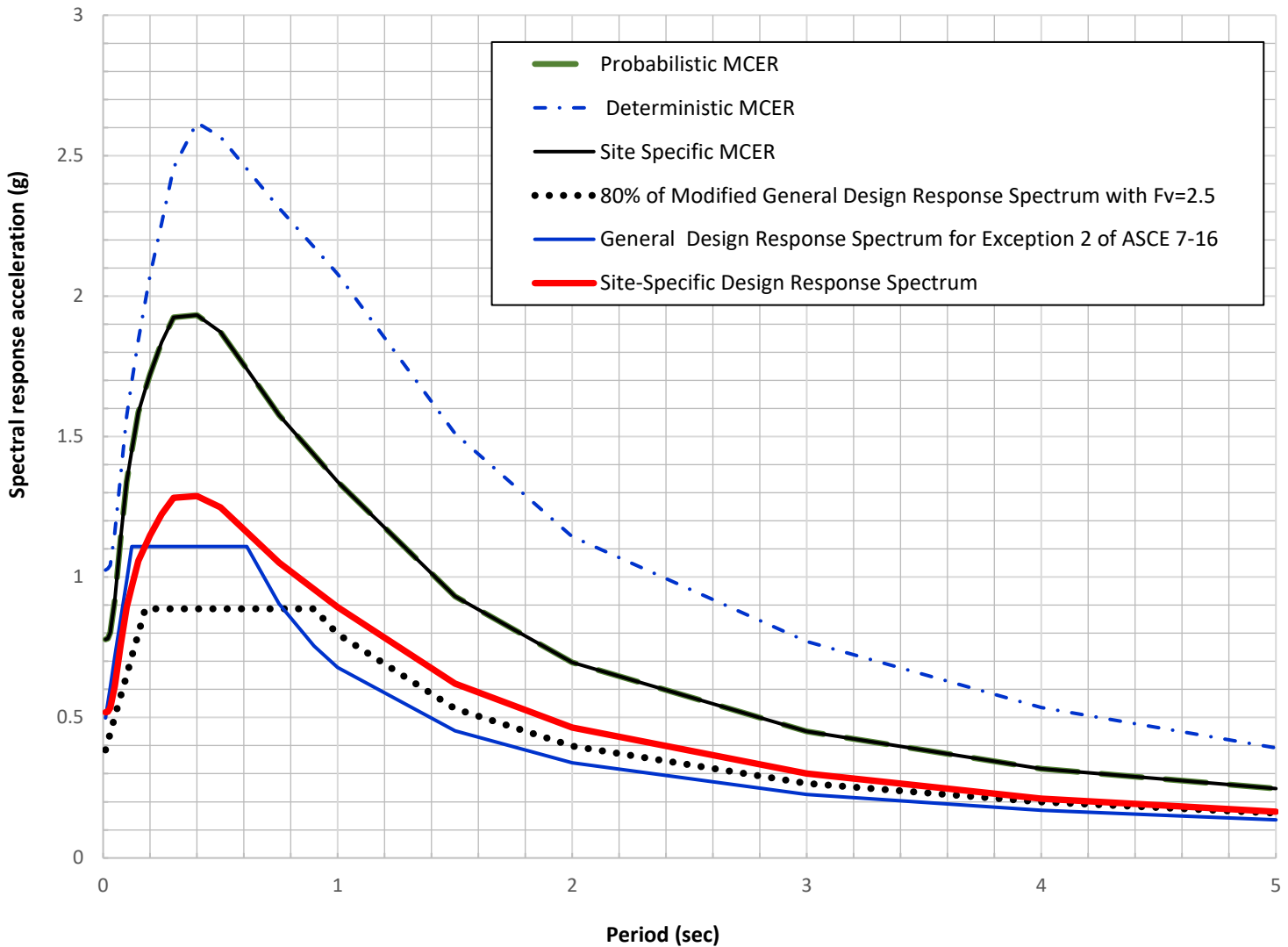
PROJECT NO.
 210377.1

REPORT DATE
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FIGURE 4

PERIOD (seconds)	SITE-SPECIFIC DESIGN SPECTRAL ACCELERATION Sa, (g)
0.01	0.518
0.02	0.521
0.03	0.535
0.05	0.611
0.075	0.760
0.1	0.893
0.122	0.967
0.15	1.058
0.180	1.111
0.2	1.148
0.25	1.224
0.3	1.283

PERIOD (seconds)	SITE-SPECIFIC DESIGN SPECTRAL ACCELERATION Sa, (g)
0.4	1.288
0.5	1.249
0.612	1.160
0.75	1.051
0.899	0.957
1	0.893
1.5	0.621
2	0.464
3	0.301
4	0.211
5	0.165



Note: See Table 3 of the report for ordinates of the various curves.



SITE-SPECIFIC DESIGN RESPONSE SPECTRUM

Proposed Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

PROJECT NO.
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DATE
July 2021

FIGURE 5



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APPENDIX A FIELD EXPLORATION



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Appendix A Field Exploration

General

The field exploration for the proposed project consisted of drilling, testing, sampling, and logging of eight exploratory borings (B-1 through B-6, P-1, and P-2) and performing percolation testing in two of the borings (P-1 and P-2). The approximate locations of the exploration are shown on Figure 2 – Site Plan and Boring Location Map.

We obtained permits for the borings from the Long Beach Department of Public Health (LBDPH). The permits are included at the end of this appendix.

The borings were first excavated to 5 feet below ground surface (bgs) using a hand-auger to clear potential underground utilities. Upon completion of exploration, borings B-1 through B-4 were backfilled with neat cement and the others with soil cuttings. The surface of all locations was repaired to match existing conditions, and the paved locations were patched with Portland cement concrete to match existing conditions.

Exploratory Borings

Drilling operation for the borings was performed by 2R Drilling of Chino, California using a CME-75 truck-mounted drill rig equipped with 8-inch diameter hollow-stem-auger (HSA). The borings were advanced to a maximum depth of 5.0 to 81.5 feet bgs on June 4, 2021.

An explanation of the boring logs is presented as Figure A-1. The boring logs are presented as Figures A-2 through A-9. The boring logs describe the earth materials encountered, samples obtained, and show the field and laboratory tests performed. The logs also show the boring number, drilling date, and the name of the logger and drilling subcontractor. The borings were logged by a Twining engineer using the Unified Soil Classification System under the supervision of a registered California Geotechnical Engineer. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Drive and bulk samples of representative earth materials were obtained from the borings.

Disturbed samples were obtained from select depths using a Standard Penetration Test (SPT) sampler. This sampler consists of a 2-inch O.D., 1.4-inch I.D. split barrel shaft without room for liner. Soil samples obtained by the SPT sampler were retained in plastic bags. A California modified sampler was also used to obtain drive samples of the soils from select depths. This sampler consists of a 3-inch outside diameter (O.D.), 2.4-inch inside diameter (I.D.) split barrel shaft. The samples were retained in brass rings for laboratory testing.

When the boring was drilled to a select depth, the sampler was lowered to the bottom of the boring and then driven a total of 18 inches into the soil using an automatic hammer weighing 140 pounds dropped from a height of 30 inches. The number of blows required to drive the samplers the final 12 inches is presented on the boring logs. Where sampler refusal is encountered and the sampler does not advance 18 inches, the total number of blows per number of inches advanced is presented. The blow counts given are field raw blow counts that have not been modified to account for field and/or depth conditions.



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Percolation Testing

Percolation testing were performed in borings P-1 and P-2. After being advanced to 5 feet bgs using a hand-auger, the borings were drilled to 5 feet bgs again using an 8 inch-diameter, truck-mounted, hollow-stem auger. The borings were drilled under the observation of a field engineer who logged the subsurface conditions encountered and collected samples of the subsurface materials encountered.

The percolation test holes were prepared by placing approximately 1 inch of gravel at the bottom of the hole. A 3-inch diameter perforated PVC pipe wrapped in filter sock was placed at the bottom of the hole and the annular space around the pipe was backfilled with gravel.

After preparing the percolation test holes, the percolation was performed in accordance with the requirements of Los Angeles County. After presoaking, the test holes were filled with water to at least 12 inches above the bottom of the excavation. Measurements were recorded at least 30-minute intervals for a total of 6 or until percolation rates stabilized. The average drop that occurred over the last 3 readings was used to determine the percolation rate at each test location. Detailed test data is attached to this appendix.





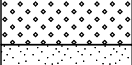




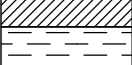



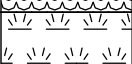

The infiltration rate was calculated by dividing the measured percolation rate by a surface area factor to account for discharge of water from the sides of the boring (i.e., non-vertical flow), which was then divided by a reduction factor to account for test method, site variability, and long-term siltation as described in the County of Los Angeles GS200.2 manual. The following formula were used:

The average drop that occurred over the final 3 readings was used to determine the infiltration rate at each test location. Based on the County of Los Angeles GS200.2 manual, a reduction factor of 3 was applied to the measured infiltration rate to obtain the design infiltration rate. A summary of test results is presented in Table A-1, and the detailed test data is attached to the end of this appendix.

Table A-1 – Infiltration Rate with a Reduction Factor of 3

Location	Depth (feet)	Infiltration Rate (in/hour)
P-1	5	0.03
P-2	5	0.04

UNIFIED SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS <small>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE</small>	GRAVEL AND GRAVELLY SOILS <small>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE</small>	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS <small>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE</small>	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		SM	SILTY SANDS, SAND - SILT MIXTURES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS <small>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE</small>	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY	
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

COARSE-GRAINED SOILS





Relative Density	SPT (blows/ft)	Relative Density (%)	Consistency	SPT (blows/ft)
Very Loose	<4	0 - 15	Very Soft	<2
Loose	4 - 10	15 - 35	Soft	2 - 4
Medium Dense	10 - 30	35 - 65	Medium Stiff	4 - 8
Dense	30 - 50	65 - 85	Stiff	8 - 15
Very Dense	>50	85 - 100	Very Stiff	15 - 30
			Hard	>30

NOTE: SPT blow counts based on 140 lb. hammer falling 30 inches

FINE-GRAINED SOILS

LABORATORY TESTING ABBREVIATIONS

ATT	Atterberg Limits
C	Consolidation
CORR	Corrosivity Series
DS	Direct Shear
EI	Expansion Index
GS	Grain Size Distribution
K	Permeability
MAX	Moisture/Density (Modified Proctor)
O	Organic Content
RV	Resistance Value
SE	Sand Equivalent
SG	Specific Gravity
TX	Triaxial Compression
UC	Unconfined Compression

Sample Symbol	Sample Type	Description
	SPT	1.4 in I.D., 2.0 in. O.D. driven sampler
	California Modified	2.4 in. I.D., 3.0 in. O.D. driven sampler
	Bulk	Retrieved from soil cuttings
	Thin-Walled Tube	Pitcher or Shelby Tube



TWINING

EXPLANATION FOR LOG OF BORINGS

Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE A-1

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-1
 DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
										4" of concrete; no base
									CL	FILL Lean CLAY; reddish brown; slightly moist; firm
					10.6		EI, CORR, MAX, DS		CL	NATIVE Lean CLAY; reddish brown; slightly moist; stiff
90	5			58	13.8	120.3	CONSOL		CL	-- same; hard
85	10			11			#200, ATT		SM	Silty SAND; medium brown; slightly moist; medium dense; abundant mica
80	15			49	12.7	103.3	DS		SM	-- same
75	20			28					SM	-- same; dark reddish brown
70	25			82	25.9	99.9			ML	Sandy SILT; strong brown; slightly moist; hard; some iron oxide staining
65	30			26			#200, ATT		ML	SILT; dark yellowish brown; slightly moist; very stiff
60	35									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21











LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO. 210377.1	REPORT DATE June 2021	FIGURE A - 2
-------------------------	--------------------------	--------------

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-1
 DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
				40	23.0	101.6	CONSOL		CL	Lean CLAY, medium brown, slightly moist; very stiff
55	40			19			#200, ATT		ML	SILT; medium brown; slightly moist; very stiff
50	45			83	14.8	115.6			SM	Silty SAND; yellowish brown; slightly moist; dense
45	50			19					ML	Sandy SILT, light olive brown; slightly moist; very stiff
40	55									
35	60			34					SM	Silty SAND, olive brown; slightly moist, dense
30	65									
25	70									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO. 210377.1	REPORT DATE June 2021	FIGURE A - 2
-------------------------	--------------------------	--------------

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-1
 DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
				38					SM	Silty SAND, olive brown; slightly moist, dense <i>(continued)</i>
20	75									
15	80			47					SM	-- same; gray
10	85									Total Depth = 81.5 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with neat cement and patched with PCC at completion.
5	90									
0	95									
-5	100									
-10	105									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE A - 2

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-2
 DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
										3" of concrete; no base
									CL	FILL Lean CLAY with sand; reddish brown; slightly moist
									CL	NATIVE Lean CLAY; reddish brown; slightly moist
90	5			23			ATT		CL	-- same; very stiff
85	10			25	10.4	105.6	#200, DS		ML	Sandy SILT; yellowish brown; slightly moist; medium dense
80	15			10					SM	Silty SAND; light brown; slightly moist; medium dense
75	20			49	16.3	100.2			ML	Sandy SILT; yellowish brown; slightly moist; hard; some caliche veins
70	25			27					SM	Silty SAND; yellowish brown; slightly moist; medium dense; some mica
65	30									Total Depth = 26.5 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with neat cement and patched with PCC at completion.
60	35									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE A - 3

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-3
 DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
										5" of concrete; no base
									CL	FILL Lean CLAY; reddish brown; slightly moist
									CL	NATIVE Lean CLAY; reddish brown; slightly moist
90	5			64	12.8	122.0			CL	-- same; hard
85	10			15			#200		ML	Sandy SILT; reddish brown; slightly moist; stiff
80	15			27	6.6	104.5			SM	Silty SAND; light yellowish brown; slightly moist; medium dense
75	20			21			ATT		ML	Sandy SILT; dark yellowish brown; slightly moist; very stiff
70	25			68	31.5	93.8			ML	-- same; dark grayish brown; hard; some mica
65	30									Total Depth = 26.5 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with neat cement and patched with PCC at completion.
60	35									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE A - 4

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-4
 DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
									CL	6" of concrete; no base FILL Lean CLAY; dark brown; slightly moist
									CL	NATIVE Lean CLAY; reddish brown; slightly moist
90	5			20					CL	-- same; stiff
85	10			37	24.3	102.6			ML	Sandy SILT; light brown; slightly moist; very stiff
80	15			19			#200		ML	SILT with sand; light yellowish brown; slightly moist; very stiff
75	20			60	6.9	102.2			SM	Silty SAND; light brownish gray; slightly moist; dense
70	25			28					ML	Sandy SILT; yellowish brown; slightly moist; very stiff; some mica
65	30									Total Depth = 26.5 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with neat cement and patched with PCC at completion.
60	35									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

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June 2021

FIGURE A - 5

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-5
 DRIVE WEIGHT N/A DROP N/A DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD HA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
							#200; ATT; R-Value		CL	4.5" of concrete; no base FILL Sandy Lean CLAY; reddish brown; slightly moist
									CL	NATIVE Lean CLAY; reddish brown; slightly moist
90	5									Total Depth = 5.0 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with cuttings and patched with PCC at completion.
85	10									
80	15									
75	20									
70	25									
65	30									
60	35									

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO. 210377.1	REPORT DATE June 2021	FIGURE A - 6
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DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** B-6
 DRIVE WEIGHT N/A DROP N/A DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD HA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven						
							6" of concrete; no base	CL	FILL Lean CLAY; reddish brown; slightly moist
							NATIVE Lean CLAY; reddish brown; slightly moist	CL	NATIVE Lean CLAY; reddish brown; slightly moist
90	5								Total Depth = 5.0 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with cuttings and patched with PCC at completion.
85	10								
80	15								
75	20								
70	25								
65	30								
60	35								

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE A - 7

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** P-1
 DRIVE WEIGHT N/A DROP N/A DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD HA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven						
								CL	FILL Lean CLAY; medium brown; dry; firm
								CL	NATIVE Lean CLAY; reddish brown, slightly moist; stiff
90	5								Total Depth = 5.0 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with cuttings at completion.
85	10								
80	15								
75	20								
70	25								
65	30								
60	35								

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE A - 8

DATE DRILLED 6/4/2021 LOGGED BY CDD **BORING NO.** P-2
 DRIVE WEIGHT N/A DROP N/A DEPTH TO GROUNDWATER (ft.) _____
 DRILLING METHOD HA DRILLER 2R Drilling SURFACE ELEVATION (ft.) 95 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven						
								CL	FILL Lean CLAY; medium brown; slightly moist; firm
								CL	NATIVE Sandy Lean CLAY; reddish brown; slightly moist; stiff
90	5								Total Depth = 5.0 feet Backfilled on 6/4/2021 No Groundwater was encountered. Backfilled with cuttings at completion.
85	10								
80	15								
75	20								
70	25								
65	30								
60	35								

BORING LOG 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/28/21



LOG OF BORING

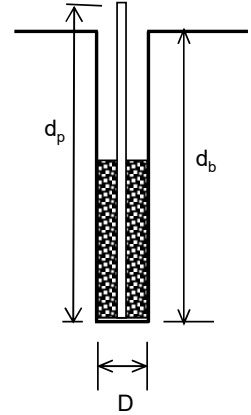
Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

PROJECT NO. 210377.1	REPORT DATE June 2021	FIGURE A - 9
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BORING PERCOLATION FIELD Log

Project No.: 210377.1
 Project Name: Fire Station No. 9

Boring No.: P-1
 Diameter of Boring (D): 8.0 inches
 Depth of Boring (d_b): 5.0 feet = 60 inches
 Diameter of Perc. Pipe : 3.5 inches
 Length of Pipe (d_p) : 5.0 feet = 60 inches



PRE-SOAK	
Date:	<u>6/4/2021</u>
Start Time:	<u>7:50 AM</u>
Elapsed Time:	<u>30.00</u> minutes
Water Remaining:	<u>Yes</u>

REDUCTION FACTOR	
Reduction Factor	<u>3.00</u>

PERCOLATION TEST Test Date: 6/4/2021 Test Performer: JAB Calculated by: DHC

Reading Number	Initial Time T _i	Final Time T _f	Elapsed Time ΔT (min)	Initial depth to water surface dw _i (inches)	Final depth to water surface dw _f (inches)	Initial height of water column d _i (inches)	Drop of water column Δd (inches)	Water height drop rate k _f = Δd / ΔT (inch/hr)	Surface area factor S _f	Raw Percolation Rate k = k _f / S _f (inch/hr)
1	8:20 AM	9:00 AM	40	15.6	17.4	44.4	1.8	2.70	22.8	0.12
2	9:00 AM	9:30 AM	30	17.4	18.0	42.6	0.6	1.20	22.2	0.05
3	9:30 AM	10:00 AM	30	18.0	18.8	42.0	0.8	1.68	21.8	0.08
4	10:00 AM	10:30 AM	30	18.8	19.7	41.2	0.8	1.68	21.4	0.08
5	10:30 AM	11:00 AM	30	19.7	20.5	40.3	0.8	1.68	21.0	0.08

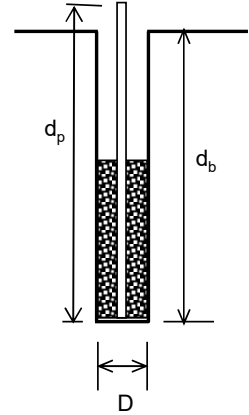
Measured Percolation Rate k_{measured} (inch/hr) = **0.08**
 Design Infiltration rate (inch/hr) = k_{measured}/RF = **0.03**

Reference: Los Angeles County Guidelines For Design, Investigation, and Reporting LID Stormwater Infiltration, GS200.2, dated 06/30/17
 City of Los Angeles, Board of Public Works, Development BMP Handbook, Part B Planning Activities, 5th edition

BORING PERCOLATION FIELD Log

Project No.: 210377.1
 Project Name: Fire Station No. 9

Boring No.: P-2
 Diameter of Boring (D): 8.0 inches
 Depth of Boring (d_b): 5.0 feet = 60 inches
 Diameter of Perc. Pipe : 3.5 inches
 Length of Pipe (d_p) : 5.0 feet = 60 inches



PRE-SOAK	
Date:	<u>6/4/2021</u>
Start Time:	<u>7:57 AM</u>
Elapsed Time:	<u>30.00</u> minutes
Water Remaining:	<u>Yes</u>

REDUCTION FACTOR	
Reduction Factor	<u>3.00</u>

PERCOLATION TEST Test Date: 6/4/2021 Test Performer: JAB Calculated by: DHC

Reading Number	Initial Time T _i	Final Time T _f	Elapsed Time ΔT (min)	Initial depth to water surface dw _i (inches)	Final depth to water surface dw _f (inches)	Initial height of water column d _i (inches)	Drop of water column Δd (inches)	Water height drop rate k _f = Δd / ΔT (inch/hr)	Surface area factor S _f	Raw Percolation Rate k = k _f / S _f (inch/hr)
1	8:27 AM	8:57 AM	30	25.2	27.0	34.8	1.8	3.60	18.0	0.20
2	8:57 AM	9:27 AM	30	27.0	28.8	33.0	1.8	3.60	17.1	0.21
3	9:27 AM	9:57 AM	30	28.8	29.6	31.2	0.8	1.68	16.4	0.10
4	9:57 AM	10:27 AM	30	29.6	30.6	30.4	1.0	1.92	15.9	0.12
5	10:27 AM	10:57 AM	30	30.6	31.4	29.4	0.8	1.68	15.5	0.11

Measured Percolation Rate k_{measured} (inch/hr) = **0.11**
 Design Infiltration rate (inch/hr) = k_{measured}/RF = **0.04**

Reference: Los Angeles County Guidelines For Design, Investigation, and Reporting LID Stormwater Infiltration, GS200.2, dated 06/30/17
 City of Los Angeles, Board of Public Works, Development BMP Handbook, Part B Planning Activities, 5th edition



WELL PERMIT

PERMIT#: **2877**

DATE ISSUED: **May 27, 2021**

PROPOSED DRILLING DATE: **June 2, 2021**

All work must be completed in accordance with Water Well Bulletin 74-81 and 74-90.

PLEASE NOTIFY INSPECTOR 48 HOURS BEFORE DRILLING AND SUBMIT THE DRILLERS WELL COMPLETION REPORT (WCR) TO vanna.kho@longbeach.gov (OR MAIL/FAX AT ADDRESS ABOVE) AND THE DEPARTMENT OF WATER RESOURCES ONLINE AT https://civicnet.resources.ca.gov/DWR_WELLS/.

Site Address: **4101 Long Beach Boulevard
Long Beach, CA 90807**

Owner: **City of Long Beach, Jonathon Bolin**

Owner Address: **411 West Ocean Boulevard
Long Beach, CA 90802**

Consulting Firm: **Twining Inc.**

Consulting Firm Address **2883 East Spring Street, Suite 300
Long Beach, CA 90806**

Drilling Company: **2R Drilling**

Drilling Co. Address: **6939 Schaefer Avenue, Suite D-304
Santa Fe Springs, CA 91710**

Type Of Permit: **Soil Boring**

Type Of Well: **Soil Boring**

Total Number Of Well/Soil Boring: **8 Borings**

THIS PERMIT IS VALID FOR ONE YEAR FROM DATE ISSUED ABOVE

Vanna Kho (Digitally signed by Vanna Kho Date: 5/27/21-CM)

Inspector Name

Cross-Connection/Water Quality

WELL PERMIT APPLICATION

EXPEDITE

(FEE'S APPLY; SEE PG. 1)

Date: _____

Proposed Drilling Date: _____

Site Address: _____

Permit Delivery: Mail Fax Pick Up E-mail: _____

Permit Type: New Well Construction Destruction Other: _____

Well Type: Monitoring Cathodic Private Domestic Public Domestic Vapor Extraction

Soil Boring Sparging Nested

Total # of: Wells _____ Borings _____ Total Cost: _____

Well Owner Name: _____ Phone: _____

Well Owner Address: _____

City State Zip Code

Consulting Firm Name: _____ Phone: _____

Consulting Firm Address: _____

City State Zip Code

Drilling Company Name: _____ Phone: _____

Drilling Company Address: _____

City State Zip Code

CA License #: _____

PROVIDE PLOT PLAN LOCATING EACH WELL CONSTRUCTED OR ABANDONED

Construction/Destruction Method
Type of casing, method of sealing, etc. (Use additional sheet or attachments)

I hereby agree to comply in every respect with all regulations of the Long Beach Department of Health and Human Services and with all ordinance and laws of the City of Long Beach and of the State of California pertaining to well construction, reconstruction and destruction. Upon completion of well and within ten days perforations in casing, and any other data deemed necessary by other city agencies.

Print Name: _____ Applicants Signature: _____

Telephone: _____ Fax Number: _____ E-mail: _____

FOR OFFICE USE ONLY		Permit #
<input type="checkbox"/> Approved <input type="checkbox"/> Denied Received by: _____ Approved by: _____ Date: _____		
<input type="checkbox"/> Approved with Conditions _____		



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APPENDIX B LABORATORY TESTING



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Appendix B Laboratory Testing

Laboratory Moisture Content and Density Tests

The moisture content and dry densities of selected driven samples obtained from the exploratory borings were evaluated in general accordance with the latest version of ASTM D2937. The results are shown on the boring logs in Appendix A, and also summarized in Table B-1.

No. 200 Wash Sieve

The amount of fines passing the No. 200 sieve was evaluated in accordance with ASTM D1140. The results are presented in Table B-2.

Atterberg Limits

Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D4318. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System. The test results are summarized in on Figure B-1 and Table B-3.

Resistance Value (R-value)

R-value testing was performed on a select bulk sample of the near-surface soils encountered at the site. The test was performed in general accordance with ASTM D2844. The result is summarized in Table B-4.

Expansion Index

The expansion index of a select soil sample was evaluated in general accordance with ASTM D4829. The specimen was molded under a specified compactive energy at approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The result of expansion index test is presented in Table B-5.

Direct Shear

Direct shear tests were performed on a remolded sample and representative modified-California soil samples in general accordance with the latest version of ASTM D3080 to evaluate the shear strength characteristics of the selected materials. The samples were inundated during shearing to represent adverse field conditions. Test results are presented on Figures B-2 through B-4.

Consolidation

Consolidation tests were performed on selected modified-California soil samples in general accordance with the latest version of ASTM D2435. The samples were inundated during testing to represent adverse field conditions. The percent consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. Test results are presented on Figures B-5 through B-6.



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Maximum Dry Density-Optimum Moisture Content

One selected bulk sample was tested to evaluate the maximum dry density and its optimum moisture content. The test was performed in general accordance with ASTM test method D1557. The result is presented on Figure B-7.

Corrosivity

Soil pH and resistivity tests were performed by Anaheim Test Lab, Inc. (ATLI) of Anaheim, California on a representative soil sample. The resistivity of the soil assumes saturated soil conditions. The chloride and sulfate contents of the selected samples were evaluated in general accordance with the latest versions of Caltrans test methods CT417, CT422, and CT 643. The test results are presented on Table B-6 and the ATLI report included in this appendix.

Table B-1 - Moisture Content and Dry Density

Boring No.	Depth (feet)	Moisture Content (%)	Dry Density (pcf)
B-1	2-5	10.6	--
B-1	5	13.8	120.3
B-1	15	12.7	103.3
B-1	25	25.9	99.9
B-1	35	23.0	101.6
B-1	45	14.8	115.6
B-2	10	10.4	105.6
B-2	20	16.3	100.2
B-3	5	12.8	122.0
B-3	15	6.6	104.5
B-3	25	31.5	93.8
B-4	10	24.3	102.6
B-4	20	6.9	102.2

Table B-2 - Number 200 Wash Results

Boring No.	Depth (feet)	Percent Passing #200
B-1	10	43.1
B-1	30	88.9
B-1	40	95.6
B-2	10	53.1
B-3	10	67.3
B-4	15	80.0
B-5	1-5	69.1



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 Long Beach CA 90806

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Table B-3 - Atterberg Limits Results

Boring No.	Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	U.S.C.S. Classification
B-1	10	0	0	0	Silty Sand (SM)
B-1	30	0	0	0	Silt (ML)
B-1	40	44	29	15	Silt (ML)
B-2	5	44	16	28	Lean Clay (CL)
B-3	20	0	0	0	Sandy Silt (ML)
B-5	1-5	23	15	8	Sandy Lean Clay (CL)

Table B-4 Resistance Value (R-value)

Boring No.	Depth (feet)	R Value
B-5	1 - 5	10

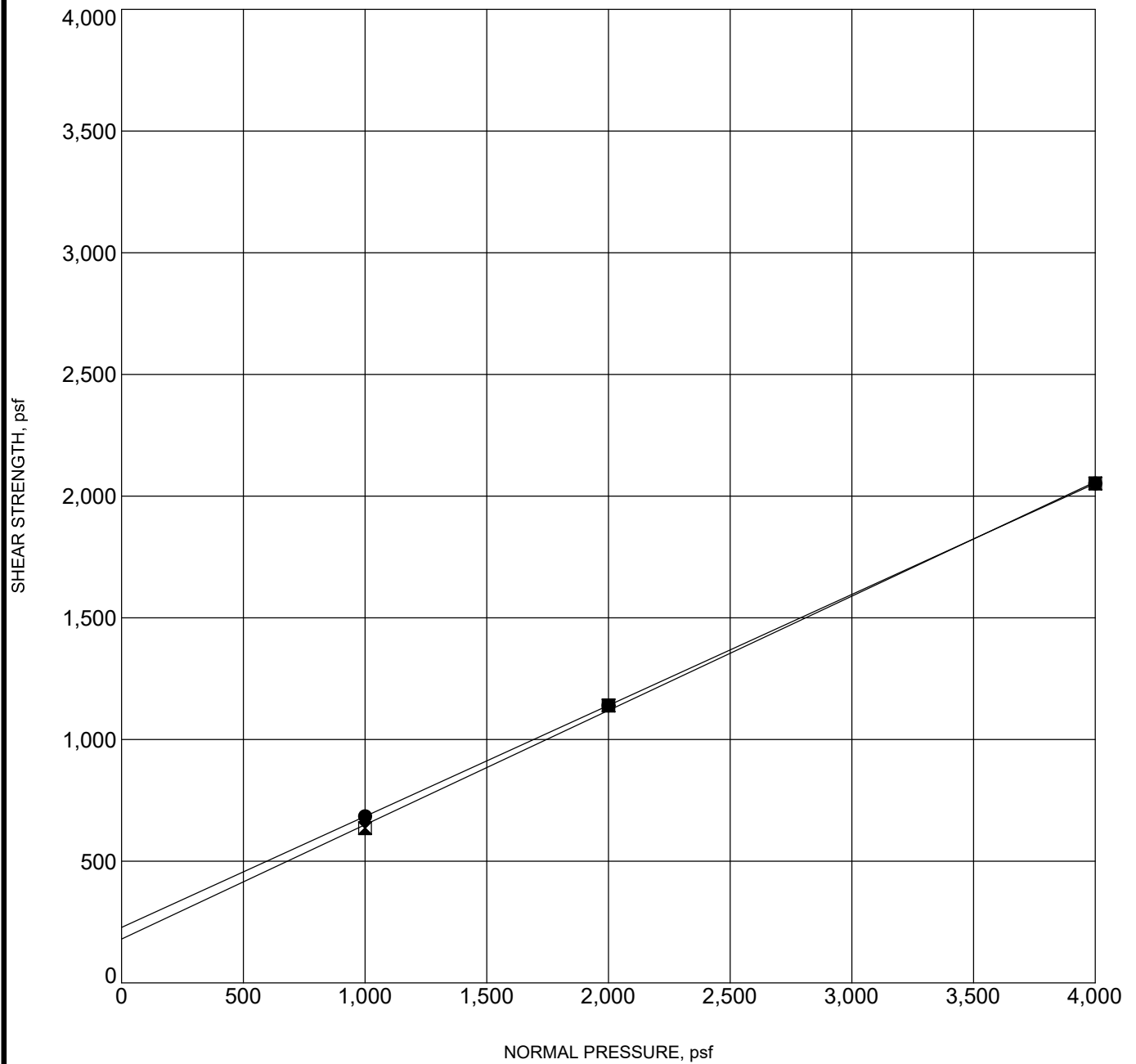
Table B-5 - Expansion Index

Boring No.	Depth (feet)	Expansion Index	Expansion Potential
B-1	2 - 5	14	Very low

Table B-6 - Corrosivity Test Results

Boring No.	Depth (feet)	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfate (ppm)	Water Soluble Chloride (ppm)
B-1	2-5	7.5	3,600	489	81

DIRECT SHEAR 210377.1 - POLB FIRE STATION NO. 9.GPJ - TWINING LABS.GDT 6/22/21



Boring No.: B-1
Sample Depth (ft): 2
Sample Description: Lean CLAY
Strain Rate (in./min): 0.005
Dry Density (pcf): 115.2

Shear Strength Parameters

Peak ● Ultimate ✕

Cohesion, C (psf): 228 180
Friction Angle, Ø (deg): 25 25

Initial Moisture (%): 9.9
Final Moisture (%): 10.6



DIRECT SHEAR TEST

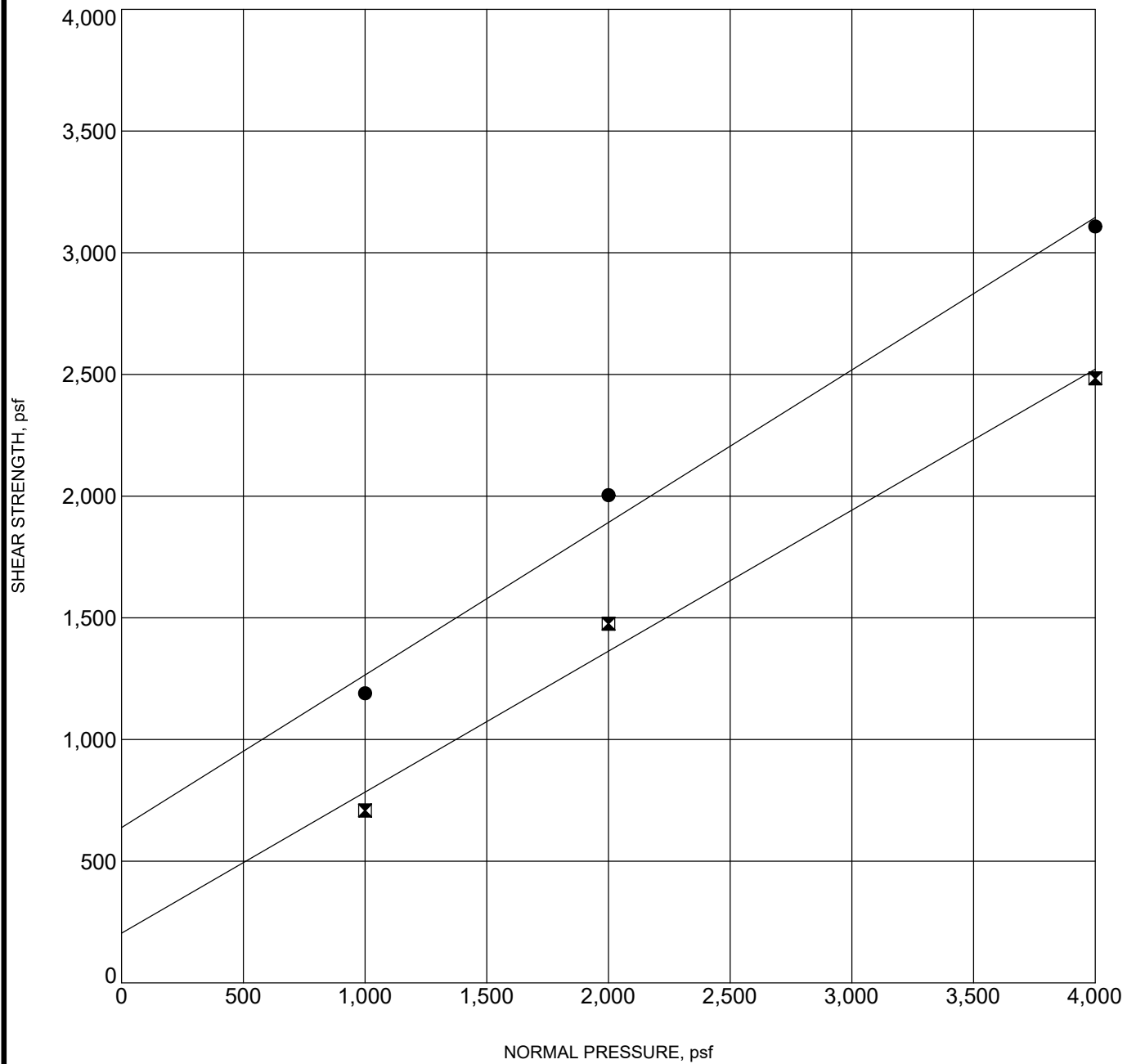
Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE B-2

DIRECT SHEAR 210377.1 - POLB FIRE STATION NO. 9.GPJ - TWINING LABS.GDT 6/22/21



Boring No.: B-1
Sample Depth (ft): 15
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 103.3

Shear Strength Parameters

Peak ● **Ultimate** ✕

Cohesion, C (psf): 638	204
Friction Angle, Ø (deg): 32	30

Initial Moisture (%): 12.7
Final Moisture (%): 17.9



DIRECT SHEAR TEST

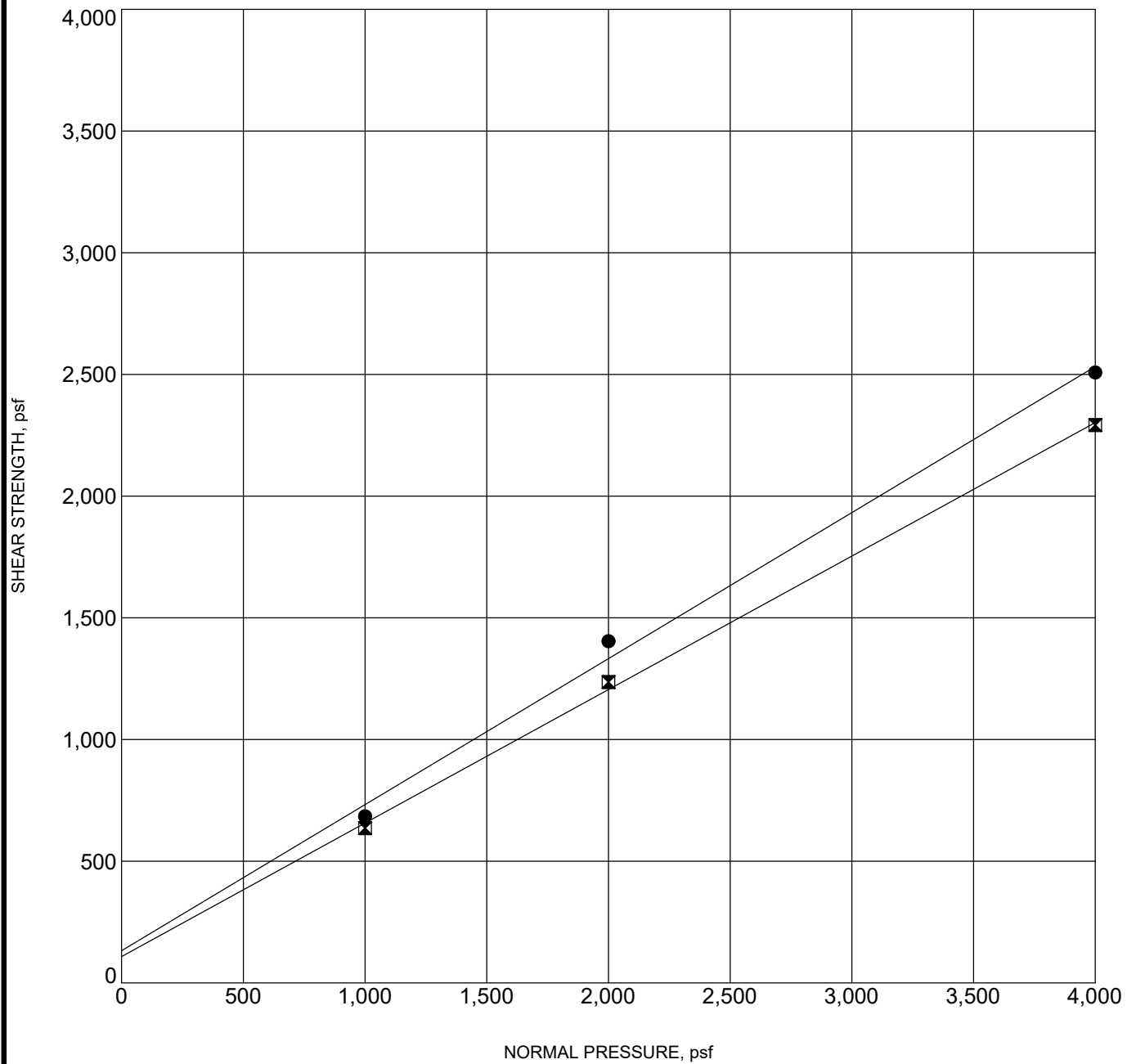
Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE B-3

DIRECT SHEAR 210377.1 - POLB FIRE STATION NO. 9.GPJ_TWINING LABS.GDT 6/22/21



Boring No.: B-2
Sample Depth (ft): 10
Sample Description: Sandy SILT
Strain Rate (in./min): 0.005
Dry Density (pcf): 105.6

Shear Strength Parameters

Peak ● **Ultimate** ✕

Cohesion, C (psf): 132 108
Friction Angle, Ø (deg): 31 29

Initial Moisture (%): 10.4
Final Moisture (%): 17.7



DIRECT SHEAR TEST

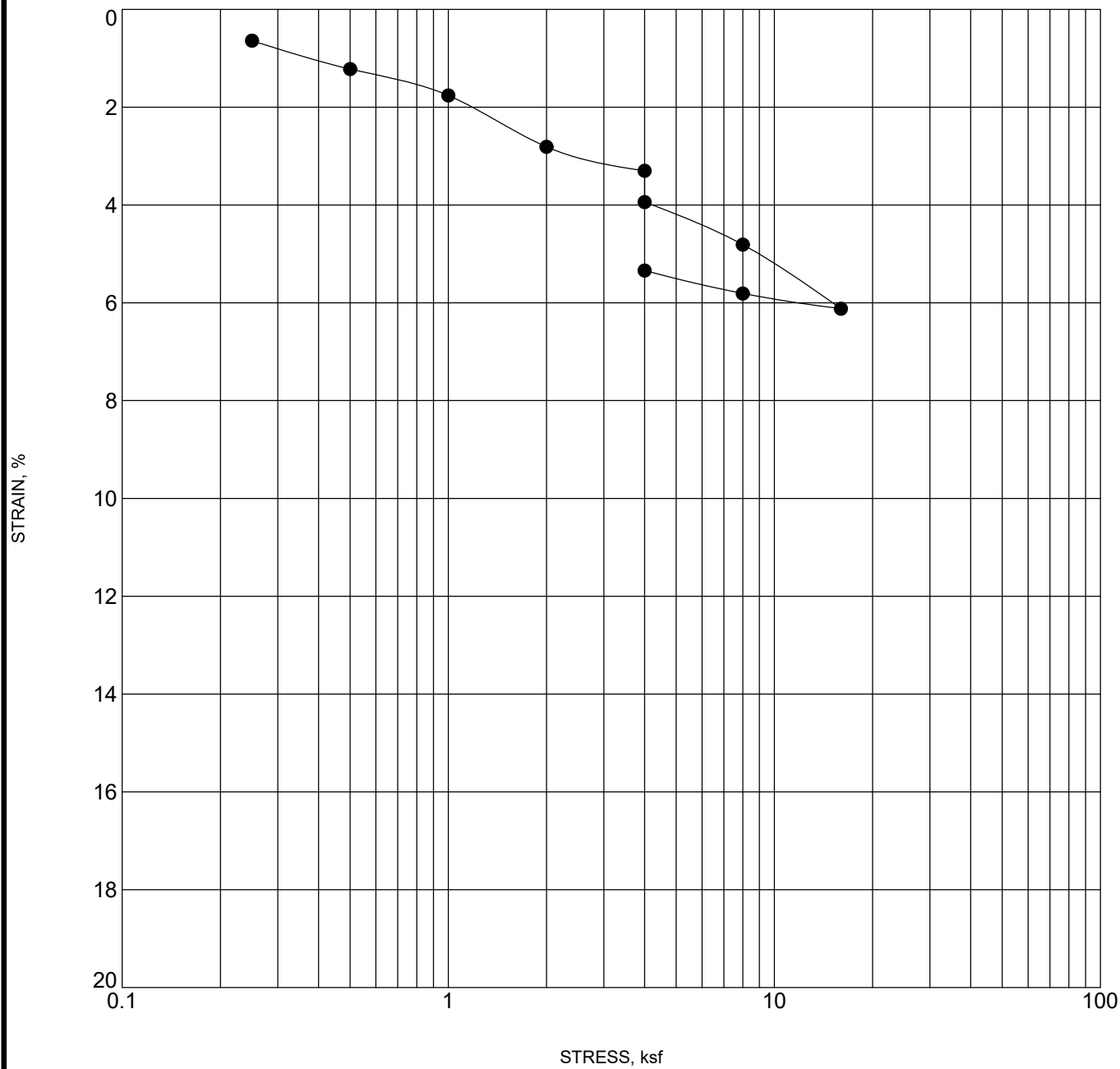
Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE B-4

CONSOL STRAIN 210377.1 - POLB FIRE STATION NO. 9.GPJ TWINING LABS.GDT 6/21/21



Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
● B-1 at 5 ft	Lean CLAY	120.3	13.8



CONSOLIDATION TEST

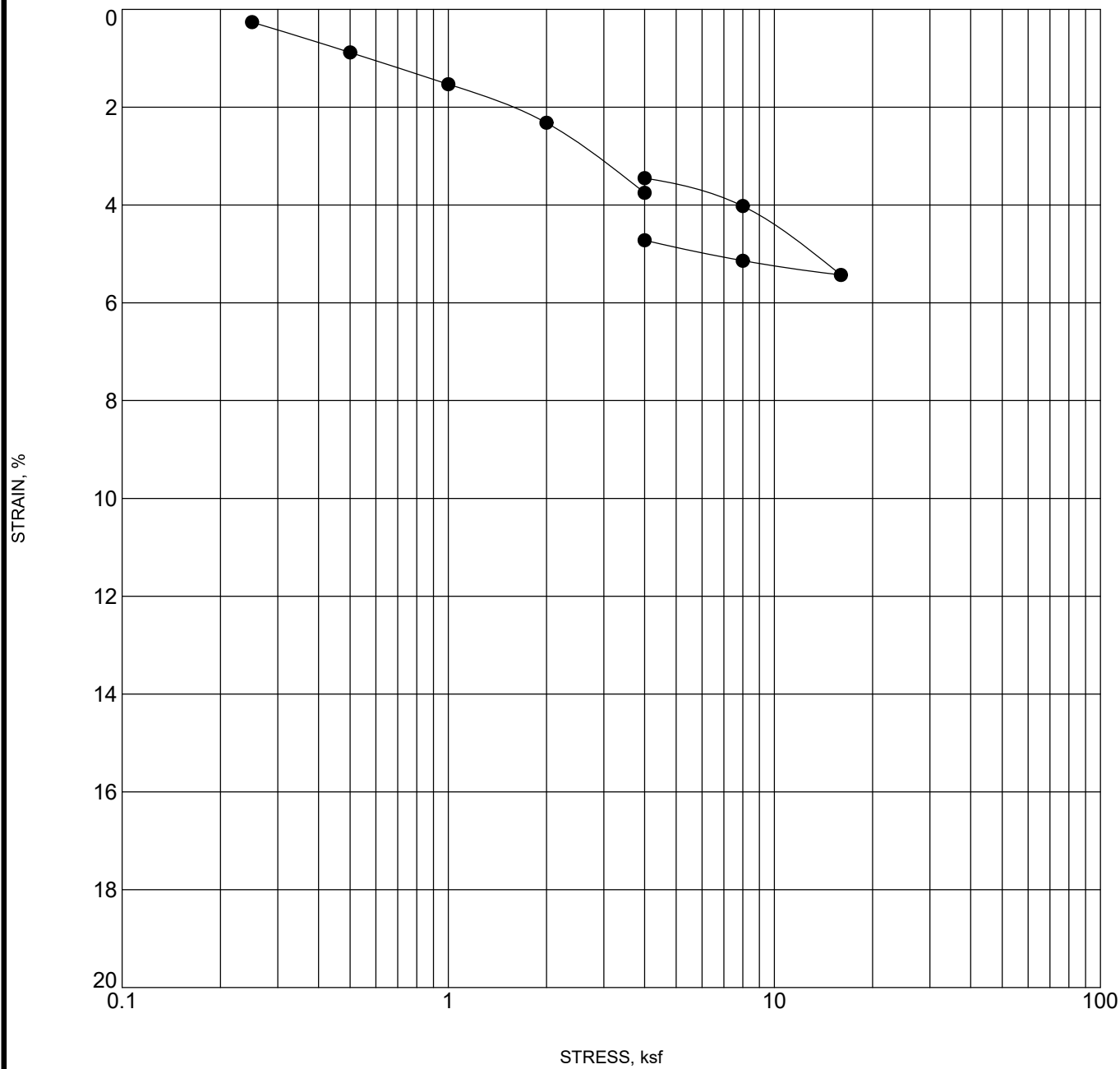
Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE B-5

CONSOL STRAIN 210377.1 - POLB FIRE STATION NO. 9.GPJ TWINING LABS.GDT 6/21/21



Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
● B-1 at 35 ft	Lean CLAY	101.6	23.0



CONSOLIDATION TEST

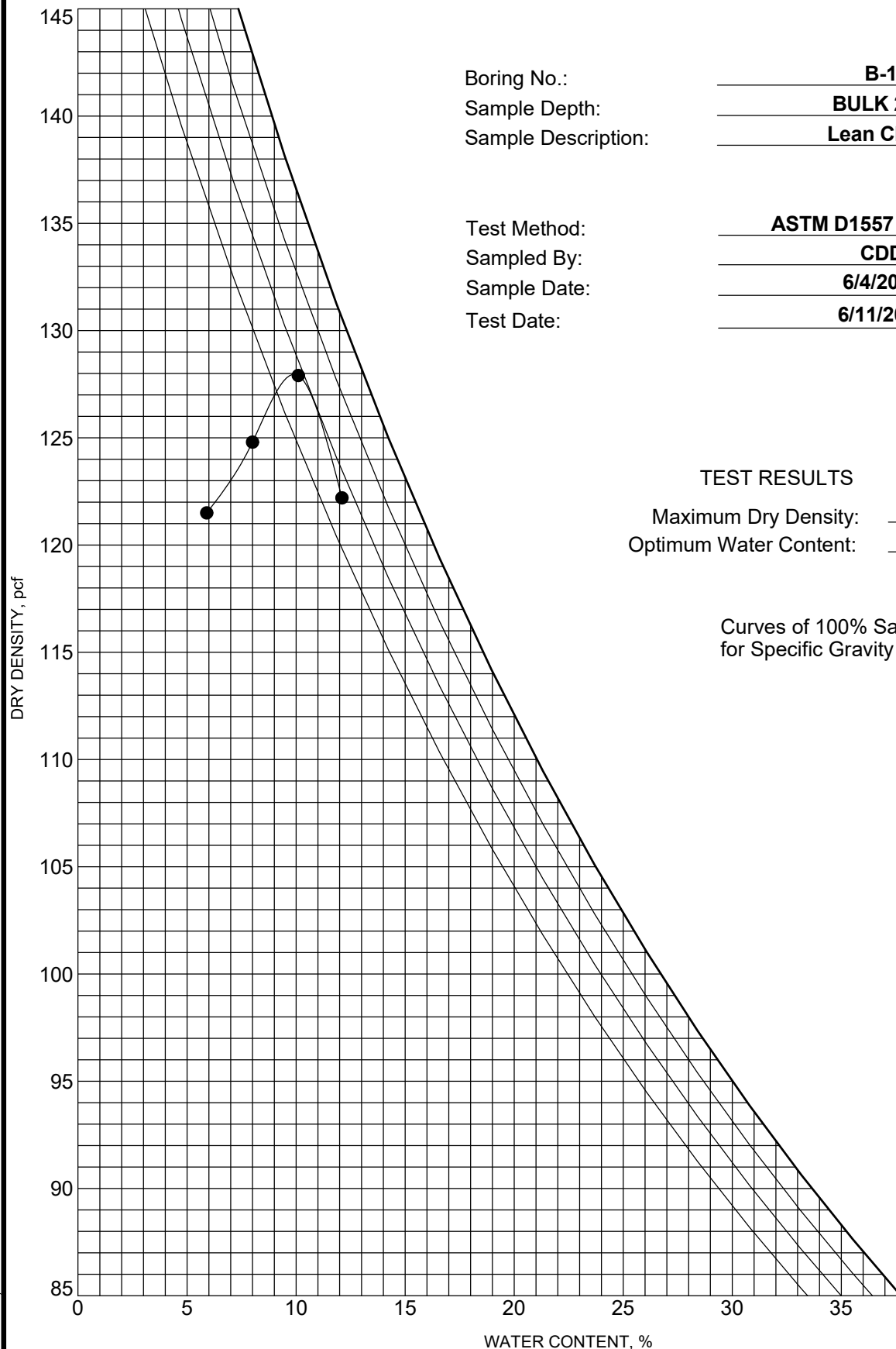
Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE B-6

COMPACTION (MODIFIED BY PAUL) 210377.1 - POLB FIRE STATION NO. 9.GPJ TWINING LABS.GDT 6/21/21



Boring No.: B-1
 Sample Depth: BULK 2-5'
 Sample Description: Lean CLAY

Test Method: ASTM D1557 Method A
 Sampled By: CDD
 Sample Date: 6/4/2021
 Test Date: 6/11/2021

TEST RESULTS

Maximum Dry Density: 128.0 pcf
 Optimum Water Content: 10.0 %

Curves of 100% Saturation
 for Specific Gravity Equal to:

- 2.80
- 2.70
- 2.60
- 2.50



MOISTURE-DENSITY RELATIONSHIP

Fire Station No. 9
 4101 Long Beach Boulevard
 Long Beach, California

PROJECT NO.
210377.1

REPORT DATE
June 2021

FIGURE B-7

ANAHEIM TEST LAB, INC.

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949)336-6544

TWINING LABS
3310 AIRPORT WAY
LONG BEACH, CA 90806

DATE: 6/14/2021

P.O. NO: Soils06092021

LAB NO: C-4916

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 210377.1
WO#: W01-21-12783
Project Name: Fire Station No. 9
Date sampled: 6/4/2021
Sample ID: B-1 @ 2-5'

ANALYTICAL REPORT

CORROSION SERIES SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
7.5	3,600	489	81

RESPECTFULLY SUBMITTED

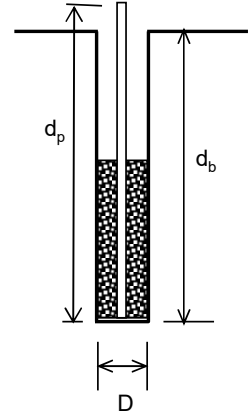


WES BRIDGER LAB MANAGER

BORING PERCOLATION FIELD Log

Project No.: 210377.1
 Project Name: Fire Station No. 9

Boring No.: P-1
 Diameter of Boring (D): 8.0 inches
 Depth of Boring (d_b): 5.0 feet = 60 inches
 Diameter of Perc. Pipe : 3.5 inches
 Length of Pipe (d_p) : 5.0 feet = 60 inches



PRE-SOAK	
Date:	<u>6/4/2021</u>
Start Time:	<u>7:50 AM</u>
Elapsed Time:	<u>30.00</u> minutes
Water Remaining:	<u>Yes</u>

REDUCTION FACTOR	
Reduction Factor	<u>3.00</u>

PERCOLATION TEST Test Date: 6/4/2021 Test Performer: JAB Calculated by: DHC

Reading Number	Initial Time T _i	Final Time T _f	Elapsed Time ΔT (min)	Initial depth to water surface dw _i (inches)	Final depth to water surface dw _f (inches)	Initial height of water column d _i (inches)	Drop of water column Δd (inches)	Water height drop rate k _i = Δd / ΔT (inch/hr)	Surface area factor S _f	Raw Percolation Rate k = k _i / S _f (inch/hr)
1	8:20 AM	9:00 AM	40	15.6	17.4	44.4	1.8	2.70	22.8	0.12
2	9:00 AM	9:30 AM	30	17.4	18.0	42.6	0.6	1.20	22.2	0.05
3	9:30 AM	10:00 AM	30	18.0	18.8	42.0	0.8	1.68	21.8	0.08
4	10:00 AM	10:30 AM	30	18.8	19.7	41.2	0.8	1.68	21.4	0.08
5	10:30 AM	11:00 AM	30	19.7	20.5	40.3	0.8	1.68	21.0	0.08

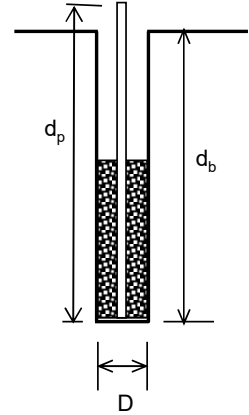
Measured Percolation Rate k_{measured} (inch/hr) = **0.08**
 Design Infiltration rate (inch/hr) = k_{measured}/RF = **0.03**

Reference: Los Angeles County Guidelines For Design, Investigation, and Reporting LID Stormwater Infiltration, GS200.2, dated 06/30/17
 City of Los Angeles, Board of Public Works, Development BMP Handbook, Part B Planning Activities, 5th edition

BORING PERCOLATION FIELD Log

Project No.: 210377.1
 Project Name: Fire Station No. 9

Boring No.: P-2
 Diameter of Boring (D): 8.0 inches
 Depth of Boring (d_b): 5.0 feet = 60 inches
 Diameter of Perc. Pipe : 3.5 inches
 Length of Pipe (d_p) : 5.0 feet = 60 inches



PRE-SOAK	
Date:	<u>6/4/2021</u>
Start Time:	<u>7:57 AM</u>
Elapsed Time:	<u>30.00</u> minutes
Water Remaining:	<u>Yes</u>

REDUCTION FACTOR	
Reduction Factor	<u>3.00</u>

PERCOLATION TEST Test Date: 6/4/2021 Test Performer: JAB Calculated by: DHC

Reading Number	Initial Time T _i	Final Time T _f	Elapsed Time ΔT (min)	Initial depth to water surface dw _i (inches)	Final depth to water surface dw _f (inches)	Initial height of water column d _i (inches)	Drop of water column Δd (inches)	Water height drop rate k _f = Δd / ΔT (inch/hr)	Surface area factor S _f	Raw Percolation Rate k = k _f / S _f (inch/hr)
1	8:27 AM	8:57 AM	30	25.2	27.0	34.8	1.8	3.60	18.0	0.20
2	8:57 AM	9:27 AM	30	27.0	28.8	33.0	1.8	3.60	17.1	0.21
3	9:27 AM	9:57 AM	30	28.8	29.6	31.2	0.8	1.68	16.4	0.10
4	9:57 AM	10:27 AM	30	29.6	30.6	30.4	1.0	1.92	15.9	0.12
5	10:27 AM	10:57 AM	30	30.6	31.4	29.4	0.8	1.68	15.5	0.11

Measured Percolation Rate k_{measured} (inch/hr) = **0.11**
 Design Infiltration rate (inch/hr) = k_{measured}/RF = **0.04**

Reference: Los Angeles County Guidelines For Design, Investigation, and Reporting LID Stormwater Infiltration, GS200.2, dated 06/30/17
 City of Los Angeles, Board of Public Works, Development BMP Handbook, Part B Planning Activities, 5th edition

Low Impact Development Plan (LID Plan)

Project Name:

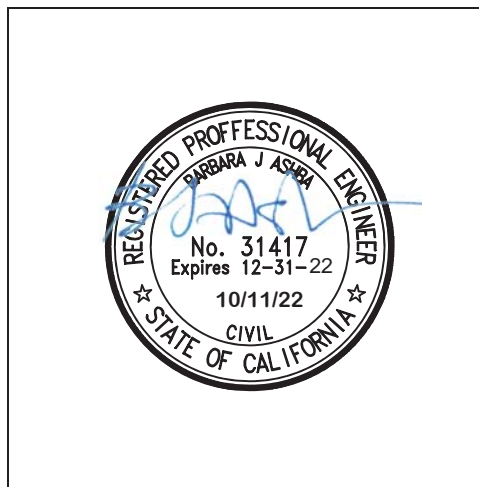
**Fire Station No. 9
4101 Long Beach Boulevard
Long Beach, California 90807**

Prepared for:

**City Of Long Beach
411 E. Ocean Boulevard
Long Beach, California 90802
(562) 570-5793**

Prepared by:

**Ashba Engineers Limited
P. O. Box 90833
Long Beach, California 90809
(562) 209-6896**




PE Stamp & Sign Here

10/13/2022

PROJECT OWNER'S CERTIFICATION

I certify that this document and all attachments were prepared under my jurisdiction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete.

Project Owner (including designees):	City of Long Beach, Marilyn Surakus Project Manager: Derry Mac Mahon		
Title:	Bureau Manager		
Department:	Public Works		
Address:	411 E. Ocean Boulevard, Long Beach, CA 90802		
Email:	Marilyn.Surakus@longbeah.gov dmacmahon@koacorp.com		
Telephone No:	(562) 570-5793 Derry Mac Mahon cell: 310-525-0681		
Signature:		Date:	10/18/2022

Low Impact Development Plan (LID Plan)

Fire Station No. 9

PREPARER (ENGINEER) CERTIFICATION

Engineer's Name:	Barbara Ashba, PE		
Engineer's Title:	President		
Company:	Ashba Engineers Limited		
Address:	P. O. Box 90833, Long Beach, CA 90809		
Email:	Barbara@ashbaengineers.com		
Telephone No:	(562) 209-6896		
I hereby certify that this Low Impact Development Plan is in compliance with, and meets the requirements set forth in the City of Long Beach's Municipal Code (§8.96.130).			
Engineer's Signature		Date	10/11/22
Place Stamp Here			

Low Impact Development Plan (LID Plan)

Fire Station No. 9

PREPARER (ARCHITECT) CERTIFICATION



Architect's Name:	Mary McGrath, Architect		
Architect's Title:	Principal		
Company:	Mary McGrath Architects		
Address:	610 16 th Street, Oakland, CA 94612		
Email:	mmcgrath@marymcgratharchitects.com		
Telephone No:	(510) 208-9400		
I hereby certify that this Low Impact Development Plan is in compliance with, and meets the requirements set forth in the City of Long Beach's Municipal Code (§8.96.130).			
Architect's Signature		Date	10/19/2022
Place Stamp Here			

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Preparer (Architect) Certification	iii
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1. PROJECT DESCRIPTION

1.1. LID APPLICABILITY

(1) LID applies to any development and redevelopment project that creates, adds, or replaces **500 sf or more** of impervious surface, where the project does not meet the exemptions listed below:

- A development or redevelopment involving only emergency construction activity required to immediately protect public health and safety;
- A development or redevelopment involving the grinding/overlaying and replacement of existing parking lots;
- A development or redevelopment involving only re-striping of permitted parking lots;
- A redevelopment resulting in land disturbing activities or replacement of 50% or less of an existing building, structure, or impervious surface area.

(2) Green Streets applies to street and road construction of **10,000 sf or more** of impervious surface area,¹ where the project does not meet the exemptions listed below:

- Routine maintenance activities that are conducted to maintain the original line and grade, hydraulic capacity, or original purpose of facility.

DEFINITIONS

1. "**Development**" means any construction to build any new public or private residential projects (whether single-family, multi-unit or planned unit development); new industrial, commercial, retail and other non-residential projects, including public agency projects; new impervious surface area; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.
2. "**LID Best Management Practices Manual**" means a manual of LID standards and practices for stormwater pollution mitigation, including technical feasibility and implementation parameters, alternative compliance for technical infeasibility, as well as other rules, requirements and procedures as the City deems necessary, for implementing the provisions of this section of the Long Beach Municipal Code.
3. "**Redevelopment**" means land-disturbing activities that result in the replacement of more than fifty percent (50%) of an existing building, structure or impervious surface area on an already developed site. It does not include routine maintenance to maintain original line and grade,

¹ Must follow USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets (December 2008 EPA-833-F-08-009) to the maximum extent practicable. Street and road construction applies to standalone streets, roads, highways, and freeway projects.

Low Impact Development Plan (LID Plan)

Fire Station No. 9

hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety or grinding/overlaying and replacement of existing parking lots.

1.2. PROJECT DESCRIPTION

Total Project Area (ft²): 16,400.54 SF (Net after Alley Dedication, 429 SF)

Total Project Area (Ac): 0.3765 Ac

EXISTING CONDITIONS

Condition	Area (ft ²)	Percentage (%)
Pervious Area:	2542	15.10
Impervious Area:	14287	84.90

PROPOSED CONDITIONS

Condition	Area (ft ²)	Percentage (%)
Pervious Area:	1797	10.96
Impervious Area:	14,603 (429 Alley)	89.04

SITE CHARACTERISTICS

<p>DRAINAGE PATTERNS/CONNECTIONS [Include a detailed description of existing and proposed drainage patterns. Describe the areas and sub-areas (to include square footage), treatment locations, direction of flow through each area, discharge point(s), ultimate termination point, etc.]</p>	<p>Existing: Refer to page 4 of the Hydrology report, Attachment A. Existing drainage runs south and east to Randolph and Long Beach Bl., respectively. Discharging south to the existing Storm Drain at Marshall Place.</p> <p>Proposed: Refer to page 8 of the Hydrology Report, Attachment A. The proposed drainage continues the south to Randolph, and east to Long Beach Bl. There are five discharge points thru the curb face, l – v, beginning at the SW corner. See 2.1.1 Page 8 for areas. And sheet 28 and 30 of the street plans for discharge amounts. The Alley continues to drain the neighborhood east to Long Beach Bl.</p>
<p>NARRATIVE PROJECT DESCRIPTION: [Include a detailed description of project areas, type of facilities, activities conducted onsite, materials and products received and stored on site, SIC Code (if applicable), land uses, land cover,</p>	<p>The project is a new Fire Station with continuous Fire Truck activity and around the clock personnel. Trucks will use the alley for entrance and exit from the driveway on Randolph. These areas will be concrete pavement for the high truck use. To the left of the truck entrance is site parking which will also be concrete. Minimum amount of planting areas are to the north and south sides of this parking; some of it being under cover of the roof. A strip of landscaping and existing trees are to remain</p>

Low Impact Development Plan (LID Plan)

Fire Station No. 9

design elements, drainage management areas (DMAs), etc.]	along the west property line. Refer to pages 3 and 4 of the Hydrology Report, Attachment A.
--	---

Low Impact Development Plan (LID Plan)

Fire Station No. 9

<p>OFFSITE RUNON</p> <p>[Describe any offsite runon anticipated and how the runon will be either accounted for in LID BMP sizing or directed around the site.]</p>	<p>There exists one roof discharge pipe from the neighboring property on the west. This discharge is minor and is directed to ground, and runs easterly across the proposed planting area to the planned drainage swale then to Long Beach Bl. A surface drainage easement has been provided for.</p>
<p>UTILITY AND INFRASTRUCTURE INFORMATION</p> <p>[Include a description of the existing and proposed onsite utility and infrastructure. Evaluate the potential impacts of stormwater infiltration on subsurface utilities, establish necessary setbacks, and if the utilities need to be relocated. Retention-based stormwater quality control measures should not be located near utility lines where an increased volume of water could damage utilities.]</p>	<p>The project power, sewer, and gas services will be feed from the existing plant in the alley, as they currently feed the site. However a new public water main will be extended from the eastside of Long Beach Bl. across the project frontage within Randolph Place to provide for Fire Sprinklers, domestic Water and Irrigation. No reclaimed Water is a available at this site.</p> <p>There are no current storm water BMP on the site and in view of the fact that the soils will not perk , no infiltration facilities are proposed. Consequently there is no impact on proposed underground facilities or building foundations.</p>
<p>SIGNIFICANT ECOLOGICAL AREAS (SEAs)</p> <p>[Identify any known Significant Ecological Area (SEA) which the project is located in or directly adjacent to, or discharging directly to, as identified by the County of Los Angeles' Significant Ecological Areas Program: http://planning.lacounty.gov/site/sea/home/]</p>	<p>There are no known SEAs on or immediately around the project per Los Angeles County SEA Figure 9.3</p>

Low Impact Development Plan (LID Plan)

Fire Station No. 9

1.3. HYDROMODIFICATION ANALYSIS

Hydromodification impacts shall be minimized to natural drainage systems. The LID Plan shall comply with all applicable LID requirements in order to maximize onsite compliance.

ANSWER YES OR NO AS APPLICABLE	YES	NO
1. Does the project drain into a natural drainage system? If yes, the project will require hydromodification control measures. Provide information on the control measures proposed in the "Describe" section below.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Describe:		
2. Does the project discharge directly or via a storm drain into concrete or otherwise engineered (not natural) channels (e.g., channelized or armored with rip rap, shotcrete, etc.), which, in turn, discharge into receiving water that is not susceptible to hydromodification impacts? If yes, no hydromodification control measures are required.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Describe: From the project site south in Long Beach BI south to the City of Long Beach Storm Drain at Marshall Place; then jogging south and east through the residential neighborhood, through the Long Beach Airport to join LACFCD Storm Drain BI-0456, Unit 2 Line A, Los Cerritos Unit 3 Line C, Concrete Channel Unit 3 Line A and finally Los Cerritos Channel to Marine Stadium and the Pacific Ocean. No Hydromodification Control BMPs are required.		

Low Impact Development Plan (LID Plan)

Fire Station No. 9

1.4. PROPERTY OWNERSHIP/MANAGEMENT

<p>[Describe ownership of all portions of project and site. Include information on if any infrastructure transfer to public agencies (City, County, Caltrans, etc.). Describe any property management company/association that will be formed. Include leasee information, as applicable.]</p>	<p>The site is owned and operated by the City of Long Beach.</p> <p>The site is recorded as APN: 7139-015-900 & 901, and is Lot 36 and Portion of Lot 37, Tract No. 4493, MB 49, Page 38 of maps in the Office of the County Recorder of Los Angeles County.</p>
--	--

2. BEST MANAGEMENT PRACTICES (BMPs)

2.1. SITE DESIGN

LID BMPs MUST BE SIZED BASED ONE OF THE FOLLOWING METHODS:	METHOD CHOSEN
1. The 85th-percentile, 24-hour runoff event determined as the maximized capture stormwater volume for the area using a 48- to 72-hour drawdown time, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998)	<input type="checkbox"/>
2. The volume of annual runoff based on unit basin storage water quality volume, to achieve 80 percent or more volume treatment by the method recommended in the California Stormwater Best Management Practices Handbook – Industrial/Commercial, (2003)	<input type="checkbox"/>
3. The volume of runoff produced from a 0.75-inch storm event	<input checked="" type="checkbox"/>

<p>STORM DEPTH</p>	<p>Refer to Attachment A Page 7. Per the Los Angeles County 85th percentile map the nearest isohetal is 0.75"/24-hours depth.</p>
<p>SITE DESIGN</p> <p>[Describe site design and drainage plan including site design practices utilized and how BMPs are incorporated using the appropriate hierarchy.]</p>	<p>Runoff is directed to the surrounding streets, Randolph Place and Long Beach Boulevard. There is no adjacent underground storm drain system. Runoff will continue south on Long Beach Boulevard to enter the City Storm Drain at Marshall Place.</p> <p>The site soils were percolation tested twice, once at the proposed design depth and again at a lower elevation in an attempt to find a soil layer that would meet the minimum percolation rate per the City of Long Beach LID Manual. None were found.</p> <p>Biofiltration was reviewed, however due to the limited landscape area, sizing is not achievable. Even if pumped an adequate planter area is not available</p> <p>Capture and reuse was reviewed with Landscape plans and irrigation plans. However due to limited landscaping areas the captured water would not be used in time to provide volume for subsequent storms.</p>

Low Impact Development Plan (LID Plan)

Fire Station No. 9

	<p>Consequently the applicant has requested and in lieu fee per the City of Long Beach LID Manual for the 0.75" amount to be treated.</p>
--	---

Low Impact Development Plan (LID Plan)

Fire Station No. 9

2.1.1.1. BMP LIST

[Fill out the table below with information on the BMPs proposed in each Drainage Management Area (DMA)]

DMA DESIGNATION	DMA SQUARE FOOTAGE (sf)	IMPERVIOUSNESS OF DMA (%)	STORM WATER QUALITY DESIGN VOLUME (SWQDV, cf)	1.5 x SWQDV (cf) [Only applicable for biofiltration]	BMP TYPE [Include make & model if proprietary]	MINIMUM BMP SIZE REQUIRED (sf)	BMP SIZE PROVIDED (sf)	ACTUAL BMP VOLUME CAPACITY (cf)	GPS COORDINATES [At least 6 decimal points]
i- W/Randolph	580	89.04	29.48	NA	None	NA	NA	NA	33d49'56"N 118d11'22"W
ii-E/Randolph	3100	89.04	157.54	NA	None	NA	NA	NA	"
iii-S/LB Blvd	600	89.04	30.49	NA	None	NA	NA	NA	"
iv/Entr LB Blvd	6030	89.04	306.44	NA	None	NA	NA	NA	"
v-Culvert LB Blvd	6090	89.04	309.49	NA	None	NA	NA	NA	"

Low Impact Development Plan (LID Plan)

Fire Station No. 9

2.2. BMP SELECTION

2.2.1. INFILTRATION BMPs

NAME NOT APPLICABLE	INCLUDED [Check all that apply]
Bioretention without underdrains	<input type="checkbox"/>
Infiltration Trench	<input type="checkbox"/>
Infiltration Basin	<input type="checkbox"/>
Drywell	<input type="checkbox"/>
Proprietary Subsurface Infiltration Gallery	<input type="checkbox"/>
Permeable Pavement	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

<p>DESCRIPTION</p> <p>[Describe Infiltration BMPs. Include descriptions on selection, sizing, and feasibility, as applicable. If infiltration is infeasible, provide brief explanation, including reference to the geotechnical report.]</p>	<p>Refer to Attachment B- Geotechnical Report</p> <p>Original proposal was for infiltration. However Geotechnical Percolation testing provided results less than the minimum requirement.</p> <p>Additional testing was performed at a lower elevation with no better results.</p> <p>Therefore infiltration is infeasible.</p>
<p>CALCULATIONS</p> <p>[Show calculations to demonstrate that the Storm Water Quality Design volume can be met with Infiltration BMPs.]</p>	<p>Not applicable.</p>

Low Impact Development Plan (LID Plan)

Fire Station No. 9

2.2.2. RAINWATER HARVEST AND USE BMPs

NAME NOT APPLICABLE	INCLUDED [Check all that apply]
Above-ground cisterns and basins	<input type="checkbox"/>
Underground detention	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

<p>DESCRIPTION</p> <p>[Describe Rainwater Harvest and Use BMPs. Include descriptions on selection, suitability, sizing, and infeasibility, as applicable.]</p>	<p>Due to minimum amounts of landscaping, irrigation will not be needed in amounts that will drawdown the storage in time for the capture of subsequent storm amounts</p>
<p>CALCULATIONS</p> <p>[Show calculations to demonstrate if the Storm Water Quality Design volume can be met with Rainwater Harvest and Use BMPs. If not, document how much can be met with Rainwater Harvest and Use and why it is not feasible to meet the full volume with Rainwater Harvest and Use BMPs.]</p>	<p>Not applicable</p>

Low Impact Development Plan (LID Plan)

Fire Station No. 9

2.2.3. BIOFILTRATION BMPs

(If Infiltration BMPs and Rainwater Harvest and Use BMPs are Infeasible)

NAME NOT APPLICABLE	INCLUDED [Check all that apply]
Bioretention with underdrains	<input type="checkbox"/>
Planter Box with underdrains	<input type="checkbox"/>
Constructed Wetland	<input type="checkbox"/>
Vegetated Swale	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

<p>DESCRIPTION</p> <p>[If the full Design Storm Capture Volume cannot be met with Infiltration BMPs, and/or Rainwater Harvest and Use BMPs, describe Biofiltration BMPs. Include descriptions on selection, suitability, sizing, and infeasibility, as applicable.]</p>	<p>Biofiltration was considered. Planter boxes, and vegetated swales were reviewed, however neither was applied since the site is too small to provide adequate size and length for these BMPs.</p>
<p>CALCULATIONS</p> <p>[Show calculations to demonstrate how 1.5 times the Storm Water Quality Design volume and/or flowrate can be met with Biotreatment BMPs.]</p>	<p>Not applicable</p>

Low Impact Development Plan (LID Plan)

Fire Station No. 9

2.2.4. TREATMENT CONTROL BMPs

Treatment control BMPs can only be used as pre-treatment to LID BMPs.

<p>DESCRIPTION</p> <p>[Include descriptions on selection and sizing.</p> <p>Examples of Treatment Control BMPs include media filters, filter inserts, hydrodynamic separators, etc.)</p>	<p>Filter Inserts are provide where available room for their installation in the storm water device.</p> <p>REM Filter Drop Inlet Inserts, and Trench Drain Kristar Filter inserts.</p>
--	---

Low Impact Development Plan (LID Plan)

Fire Station No. 9

2.2.5. SITE-SPECIFIC SOURCE CONTROL MEASURES

See Table 3.2 in the LID BMP Design Manual for additional information.

NAME FIRE STATION NO 9	CHECK ONE	
	Included	Not Applicable
S-1: Storm Drain Message and Signage	<input checked="" type="checkbox"/>	<input type="checkbox"/>
S-2: Outdoor Material Storage Area Design	<input type="checkbox"/>	<input checked="" type="checkbox"/>
S-3: Outdoor Trash Storage and Waste Handling Area Design	<input checked="" type="checkbox"/>	<input type="checkbox"/>
S-4: Outdoor Loading/Unloading Dock Area Design	<input type="checkbox"/>	<input checked="" type="checkbox"/>
S-5: Outdoor Repair/Maintenance Bay Design	<input type="checkbox"/>	<input checked="" type="checkbox"/>
S-6: Outdoor Vehicle/Equipment/Accessory Washing Area Design	<input checked="" type="checkbox"/>	<input type="checkbox"/>
S-7: Fueling Area Design	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ATTACHMENT A: CALCULATIONS

[Include calculations for each BMP following an approved published design standard (i.e. City of Long Beach's Low Impact Development (LID) Best Management Practices (BMP) Design Manual. Calculations must be followed step-by-step with no alterations.]

Ashba Engineers Ltd.
P. O. Box 90833
Long Beach, CA 90809
C: (562) 209-6896
E: barbara@ashbaengineers.com

Project *CLB Fire Station No. 9*
Client Mary McGrath Architects
Address 4101 Long Beach Blvd.
Description HYDROLOGY STUDY
Designer B. Ashba

Page 1 of 20
Date 09/20/2022
Job: 8164
Issue _____
Rev. _____

REPORT OF HYDROLOGY STUDY FOR PROPOSED NEW CITY OF LONG BEACH FIRE STATION NO. 9 AT 4101 LONG BEACH BOULEVARD, LONG BEACH, CA 90807

- 1 - Contents
- 2 - Assessor's Map - Scope of Work
- 3 - Aerial Existing Site - Area Description
- 4 - Topographic Survey - Existing Drainage Patterns
- 5 - Isohyet Chart - 1-H1.5
- 6 - Runoff Coefficient Curve - Percolation Results
- 7 - 85th Percentile 24-hour Rainfall Isohyet
- 8 - Proposed New Site Plan - Drainage Pattern
- 9 - Site Peak Flow, Q50
- 10 - Peak Flow from 0.75" Storm
- 11 - 20 Peak Flow, Q10 and Q25 for discharge Curb Drains.



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Page 2 of _____
Date 09/20/2022
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Rev. _____

New Fire Station No. 9
4101 Long Beach Bl

Net Site; 16,400.53 SF, 0.3765 AC

Lot 36 and Portion of Lot 37
Tract No. 4493
MB 49 Page 38

Assessor's Parcels:
7139-015-900 & 901



Proposed Site of the New City of Long Beach Fire Station No. 9.
Existing Commercial Office Building and Improvements to be demolished and
the site prepared for new construction.

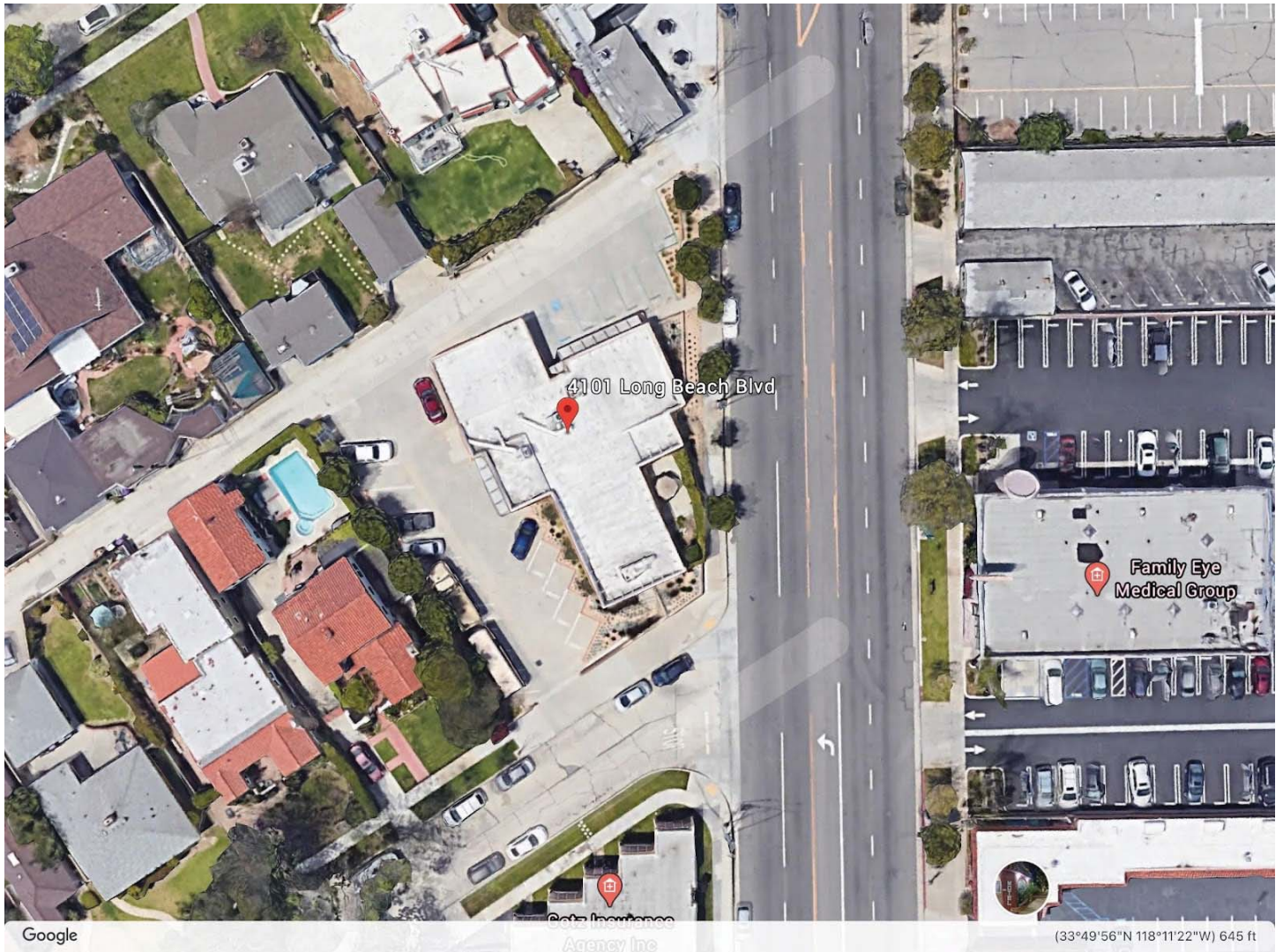
Ashba Engineers Ltd.
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C: (562) 209-6896
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Project *CLB Fire Station No. 9*
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Description HYDROLOGY STUDY
Designer B. Ashba

Page *3 of* _____
Date 09/20/2022
Job: 8164
Issue _____
Rev. _____

Aerial Existing Site
Google Earth

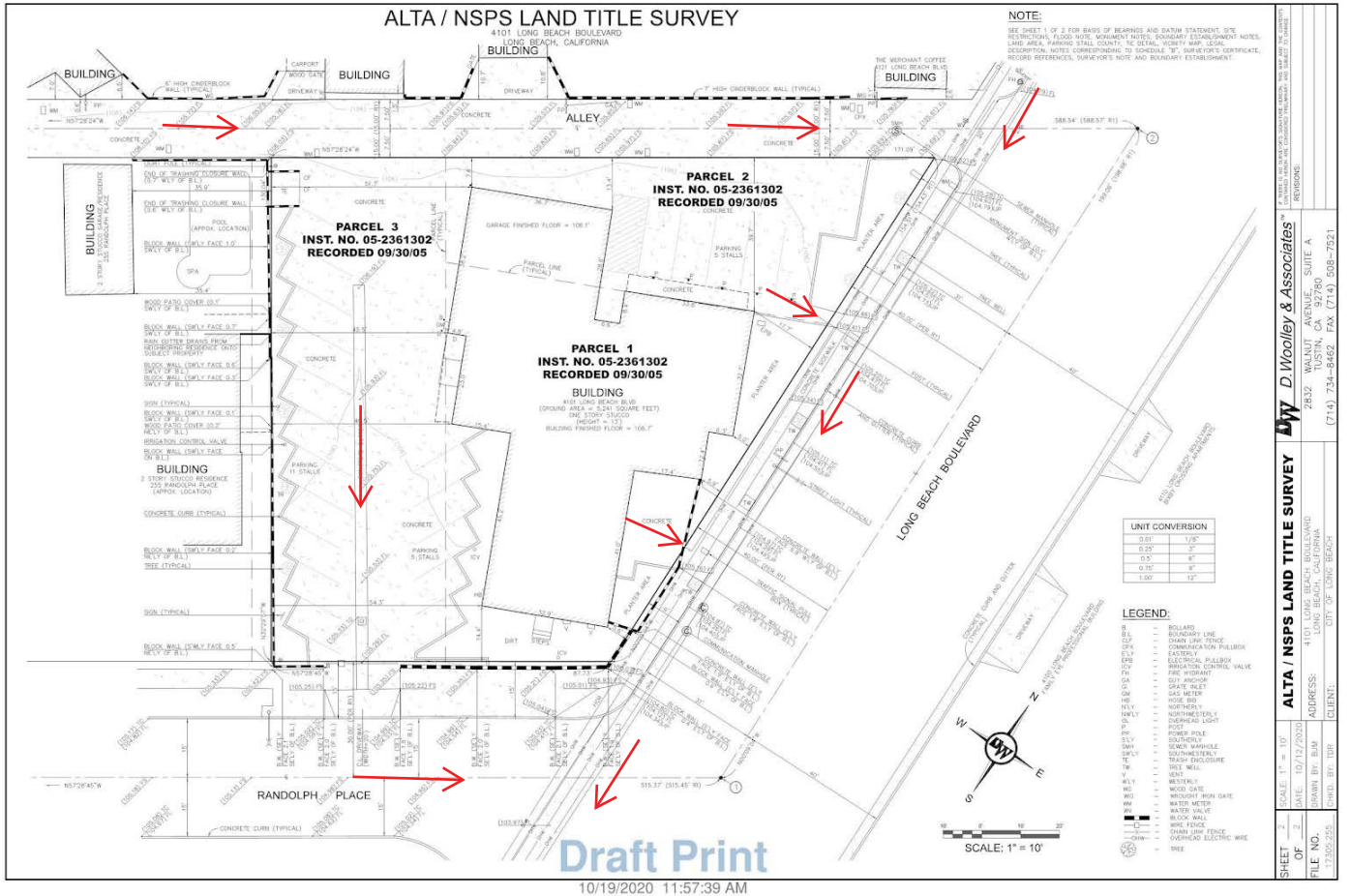
33D 49' 56" N
118D 11' 22" W



The site is in the Bixby Knolls/Los Cerritos area of Long Beach. Long Beach Boulevard is a commercial/office area running north and south. To the east and west of the commercial buildings are residential areas. As indicated Bixby Knoll are high points in the area drainage with surface drainage running in Long Beach Boulevard south entering the existing storm drain system which drains to the Los Angeles River. There are no storm drains in the immediate vicinity.

Topographic Survey
Existing Conditions

Existing Site 0.3765 Acres
Impervious Area 0.3352 Acres
Pervious Area 0.04125 Acres



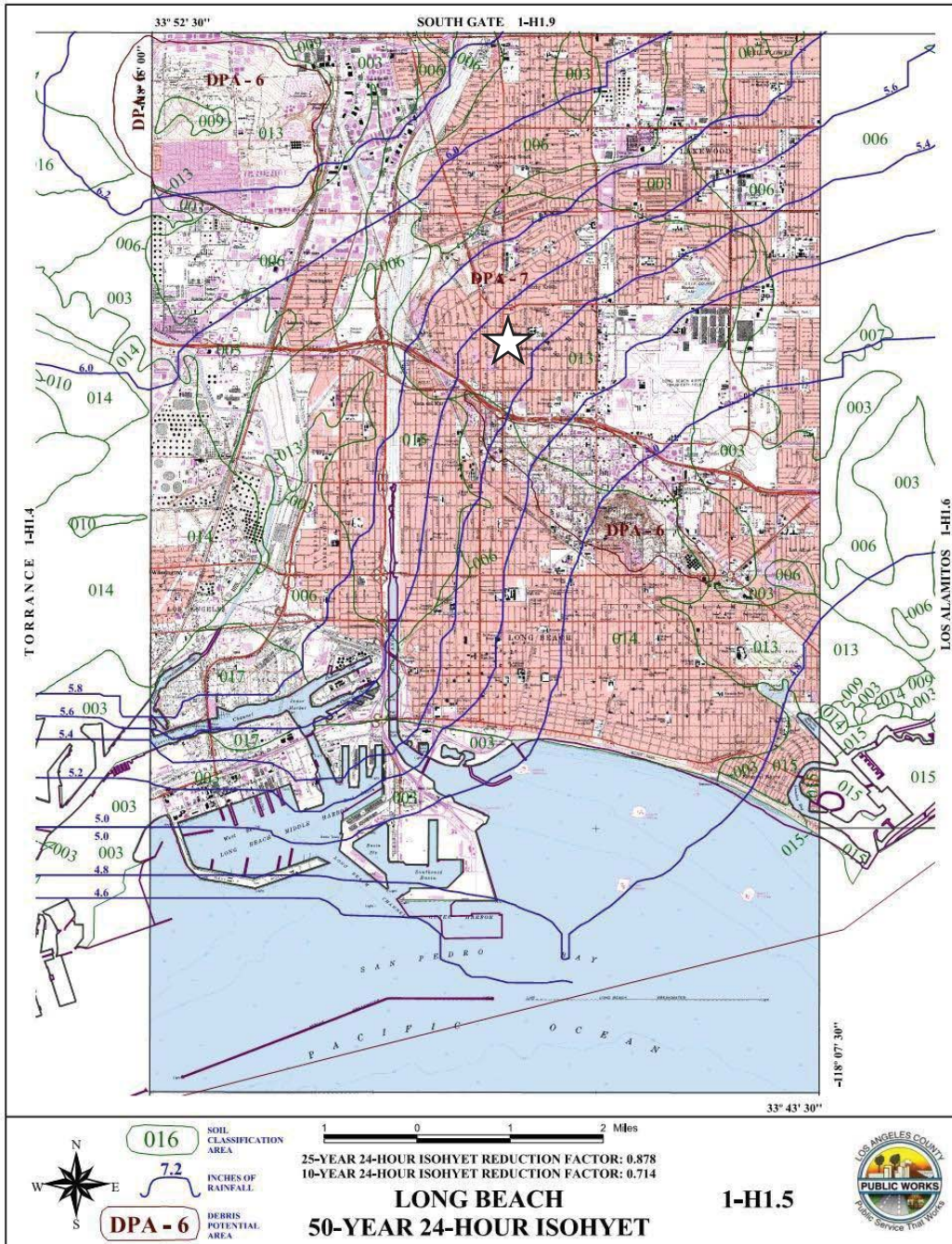
Existing Drainage Patterns are to the surrounding Streets. Alley drains the neighboring residential area. The site currently drains to Long Beach Boulevard, and Randolph Place. One existing neighboring roof drain downspout drains over the existing wall onto the site.

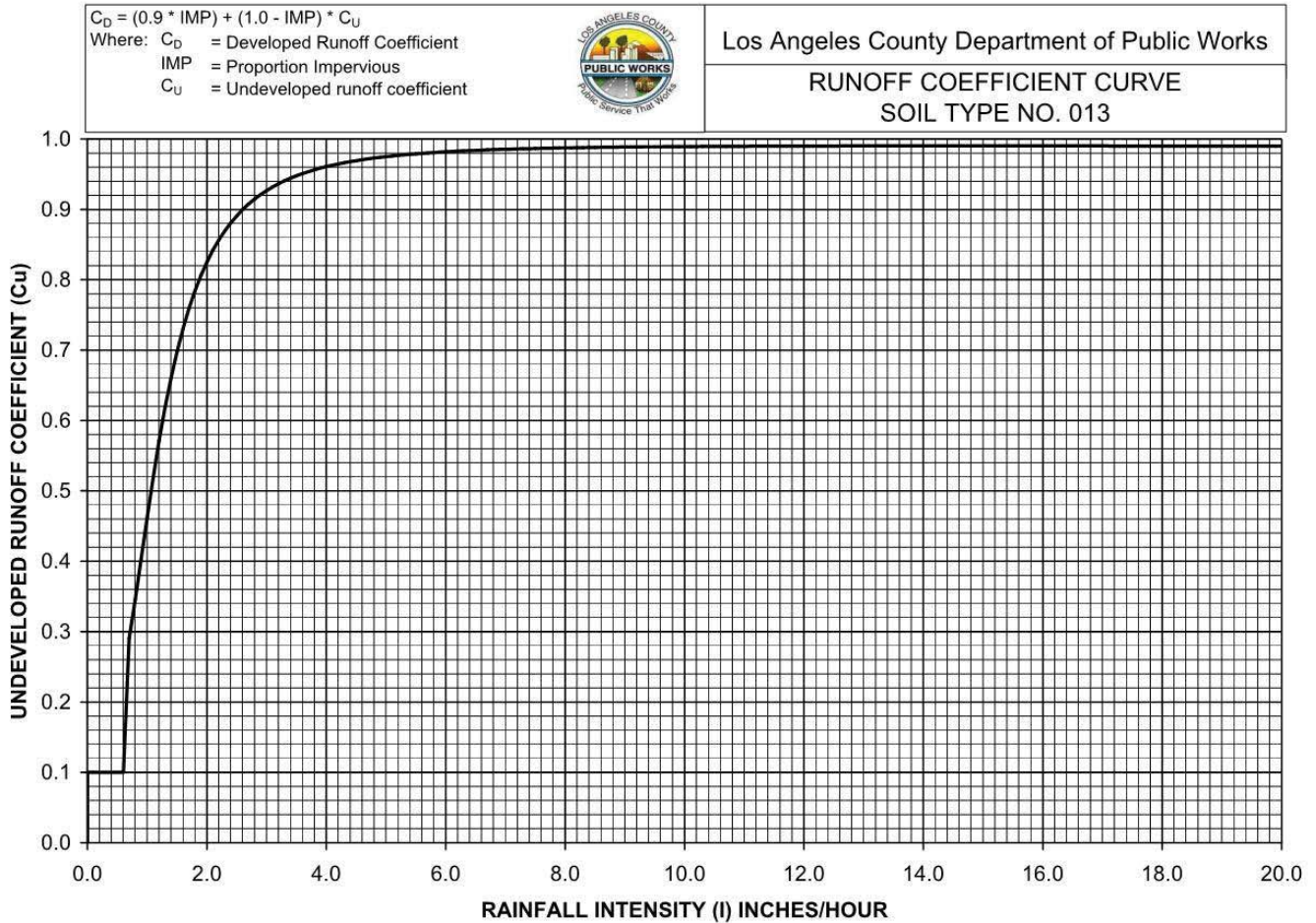
Ashba Engineers Ltd.
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Project **CLB Fire Station No. 9**
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Date 09/20/2022
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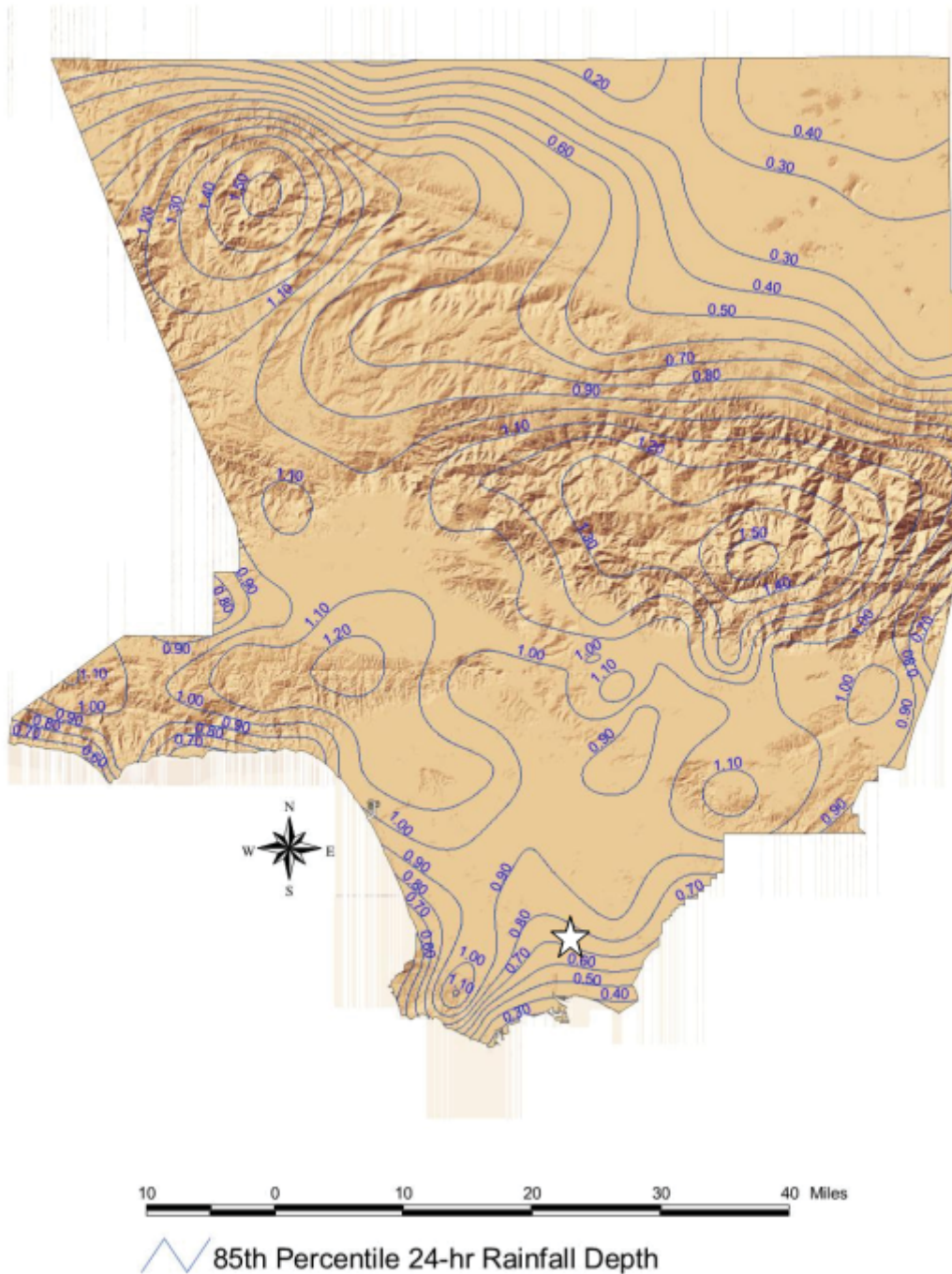
Soil Type 013
5.7 Inches 50-Yr. Isoheyt





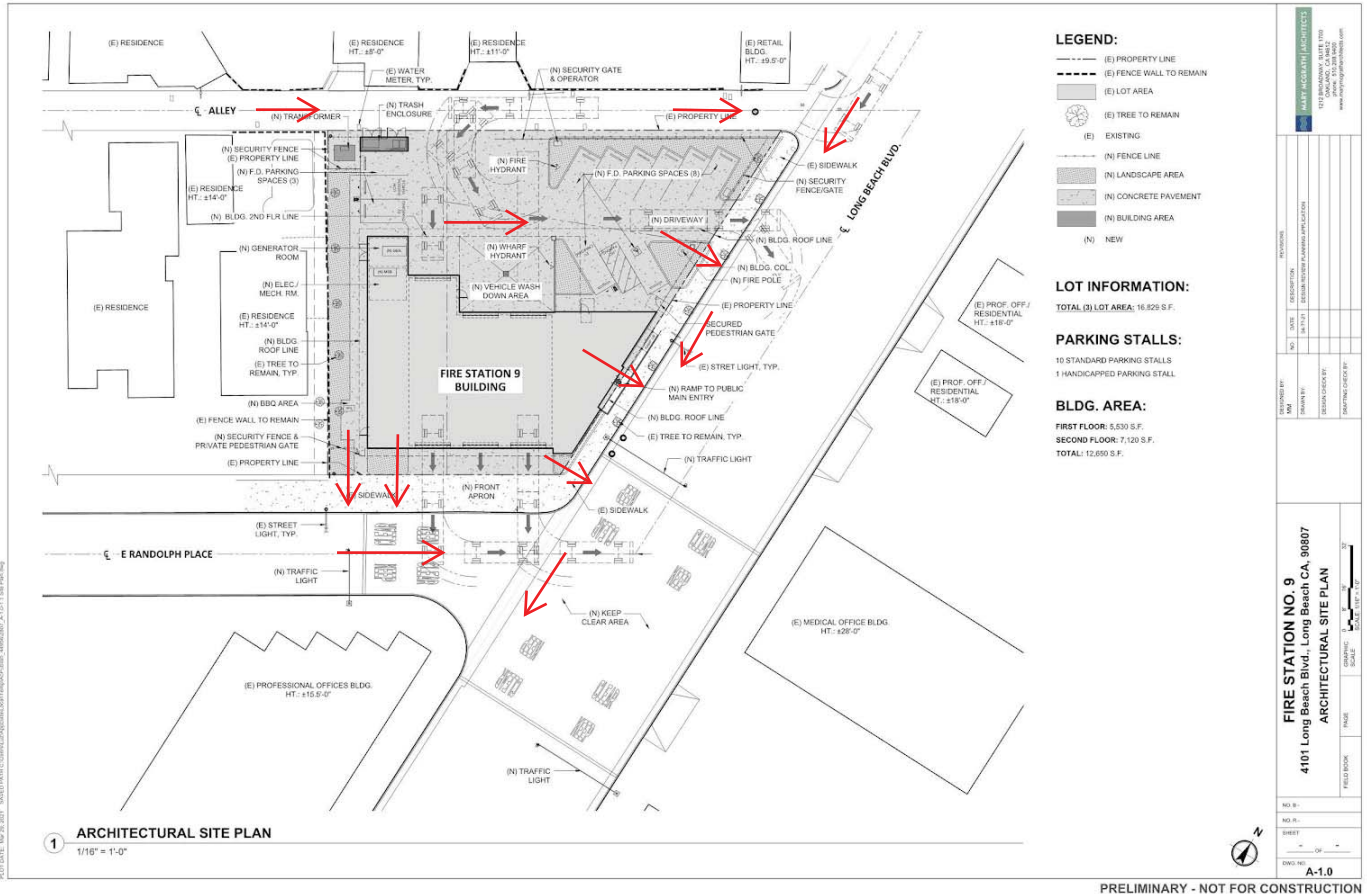
Twining Inc Geotechnical Engineering performed soil and percolation testing at the site. Testing both shallow and deep indicates the underlying soils will not perk; Kd = 0.03 and 0.04 in/hr respectively. Infiltration BMP is not feasible per Table 4-1 of the City of Long Beach LID Manual..

85th Percentile 24-hr Rainfall Isohyetal Map



Use 0.75"

Proposed New Site Plan



Existing Site 0.38 Acres
Portion Impervious 0.33524 Acres - 89.04%
Portion Pervious 0.04125 Acres - 10.96%

Pre-construction and Post-construction portions of impervious vs pervious are virtually the same. Consequently there is no change in the amount of discharge.

Post-construction Runoff follows the same patterns as the existing. Site drainage is directed to Long Beach Boulevard and Randolph Place.

Street, Randolph Pl., and Alley Improvements continue conducting runoff to Long Beach Boulevard where it continues south to enter the existing storm drain system.

Peak Flow Hydrologic Analysis

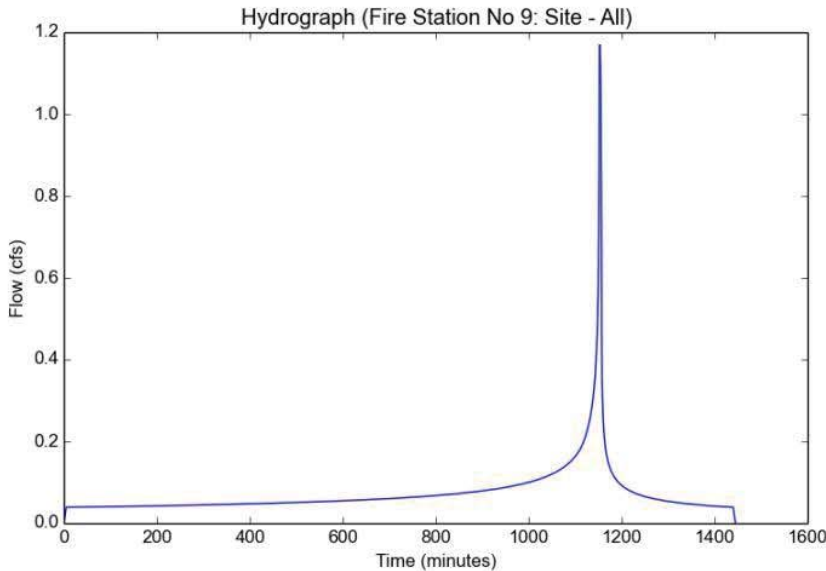
File location: C:/Users/Robert/Google Drive/8164 CLB FS No. 9 - MMA/LID/HydroCalc/Fire Station No 9 - Site - All.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	Site - All
Area (ac)	0.38
Flow Path Length (ft)	125.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.8904
Soil Type	13
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.7
Peak Intensity (in/hr)	3.4008
Undeveloped Runoff Coefficient (Cu)	0.9437
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.1631
Burned Peak Flow Rate (cfs)	1.1631
24-Hr Clear Runoff Volume (ac-ft)	0.147
24-Hr Clear Runoff Volume (cu-ft)	6402.7012



Peak Flow Hydrologic Analysis

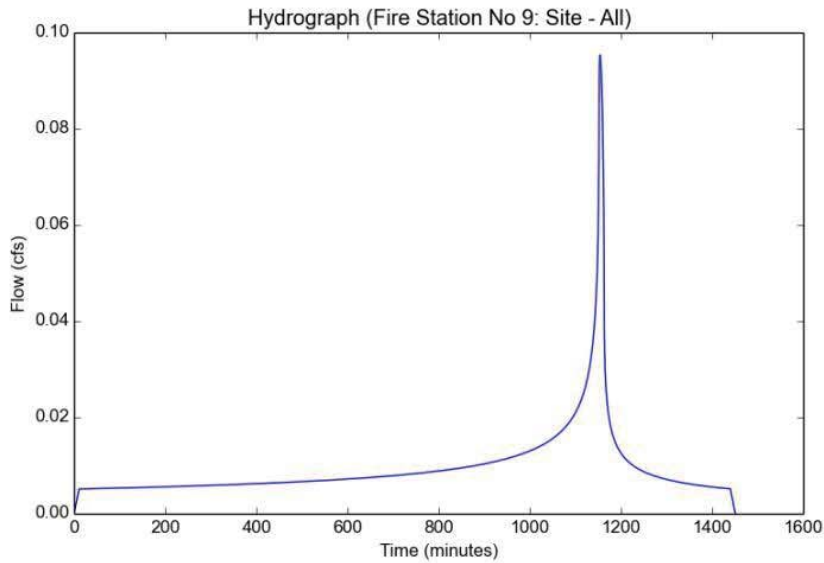
File location: C:/Users/Robert/Google Drive/8164 CLB FS No. 9 - MMA/LID/HydroCalc/Fire Station No 9 - Site - All 0.75.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	Site - All
Area (ac)	0.38
Flow Path Length (ft)	125.0
Flow Path Slope (vft/hft)	0.02
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.8904
Soil Type	13
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.3089
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.8123
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	0.0954
Burned Peak Flow Rate (cfs)	0.0954
24-Hr Clear Runoff Volume (ac-ft)	0.0191
24-Hr Clear Runoff Volume (cu-ft)	833.4416



Site LID amount.

Peak Flow Hydrologic Analysis

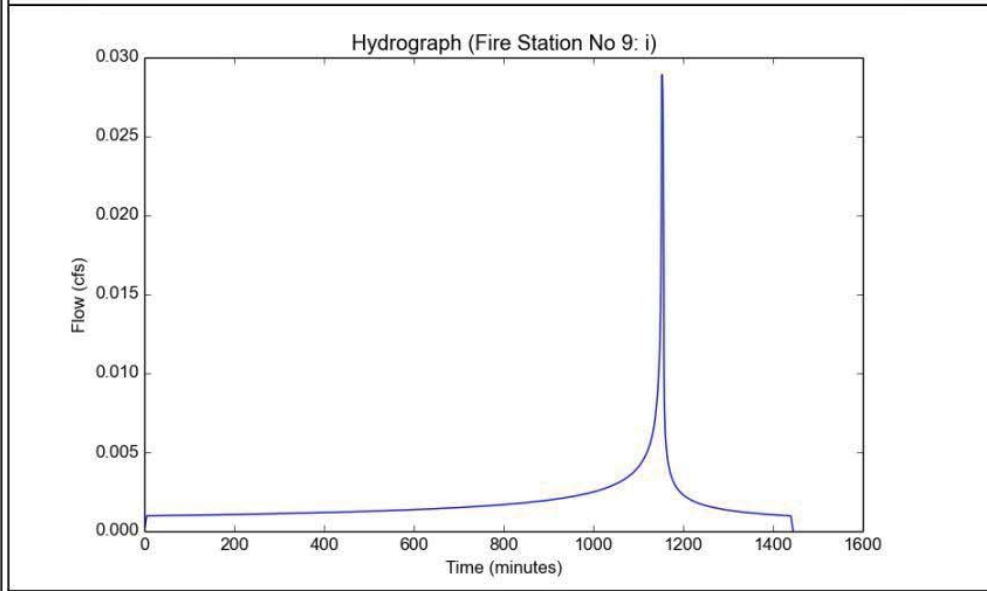
File location: E:\8164 Fire Station No 9\Fire Station No 9 - i.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	i
Area (ac)	0.0132575
Flow Path Length (ft)	40.0
Flow Path Slope (vft/hft)	0.002
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.0698
Peak Intensity (in/hr)	2.4282
Undeveloped Runoff Coefficient (Cu)	0.8815
Developed Runoff Coefficient (Cd)	0.898
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.0289
Burned Peak Flow Rate (cfs)	0.0289
24-Hr Clear Runoff Volume (ac-ft)	0.0036
24-Hr Clear Runoff Volume (cu-ft)	158.8968



Peak Flow Hydrologic Analysis

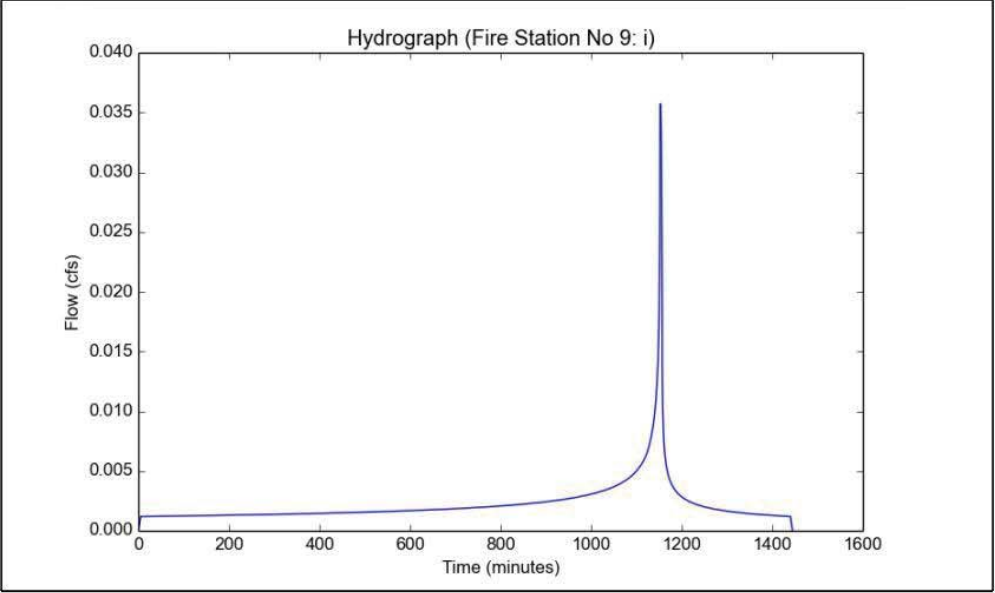
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Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	i
Area (ac)	0.0132575
Flow Path Length (ft)	40.0
Flow Path Slope (vft/hft)	0.002
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0046
Peak Intensity (in/hr)	2.9859
Undeveloped Runoff Coefficient (Cu)	0.9258
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.0356
Burned Peak Flow Rate (cfs)	0.0356
24-Hr Clear Runoff Volume (ac-ft)	0.0045
24-Hr Clear Runoff Volume (cu-ft)	195.7751



Peak Flow Hydrologic Analysis

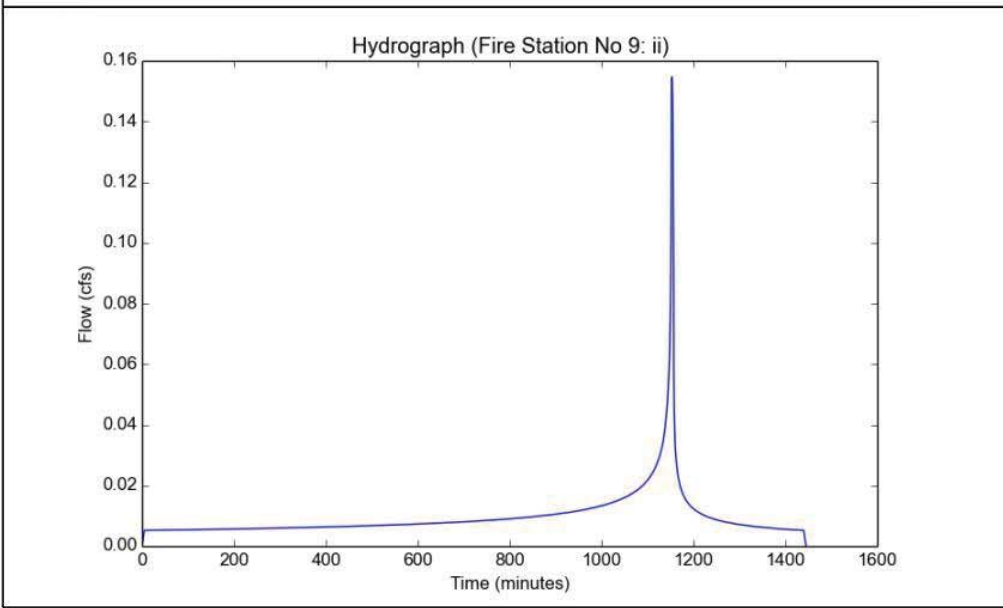
File location: E:/8164 Fire Station No 9/Fire Station No 9 - ii.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	ii
Area (ac)	0.0709366
Flow Path Length (ft)	64.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.0698
Peak Intensity (in/hr)	2.4282
Undeveloped Runoff Coefficient (Cu)	0.8815
Developed Runoff Coefficient (Cd)	0.898
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.1547
Burned Peak Flow Rate (cfs)	0.1547
24-Hr Clear Runoff Volume (ac-ft)	0.0195
24-Hr Clear Runoff Volume (cu-ft)	850.2056



Peak Flow Hydrologic Analysis

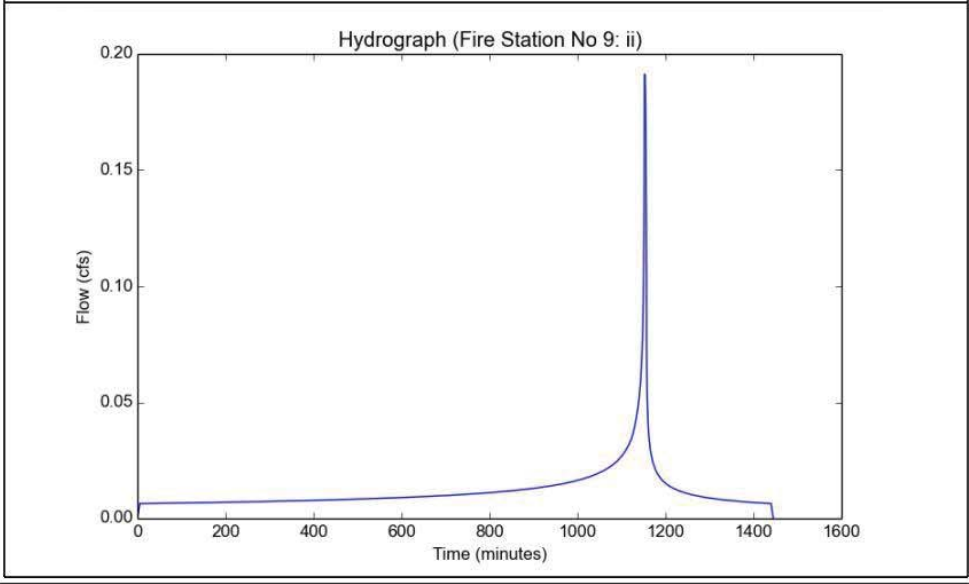
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Version: HydroCalc 1.0.2

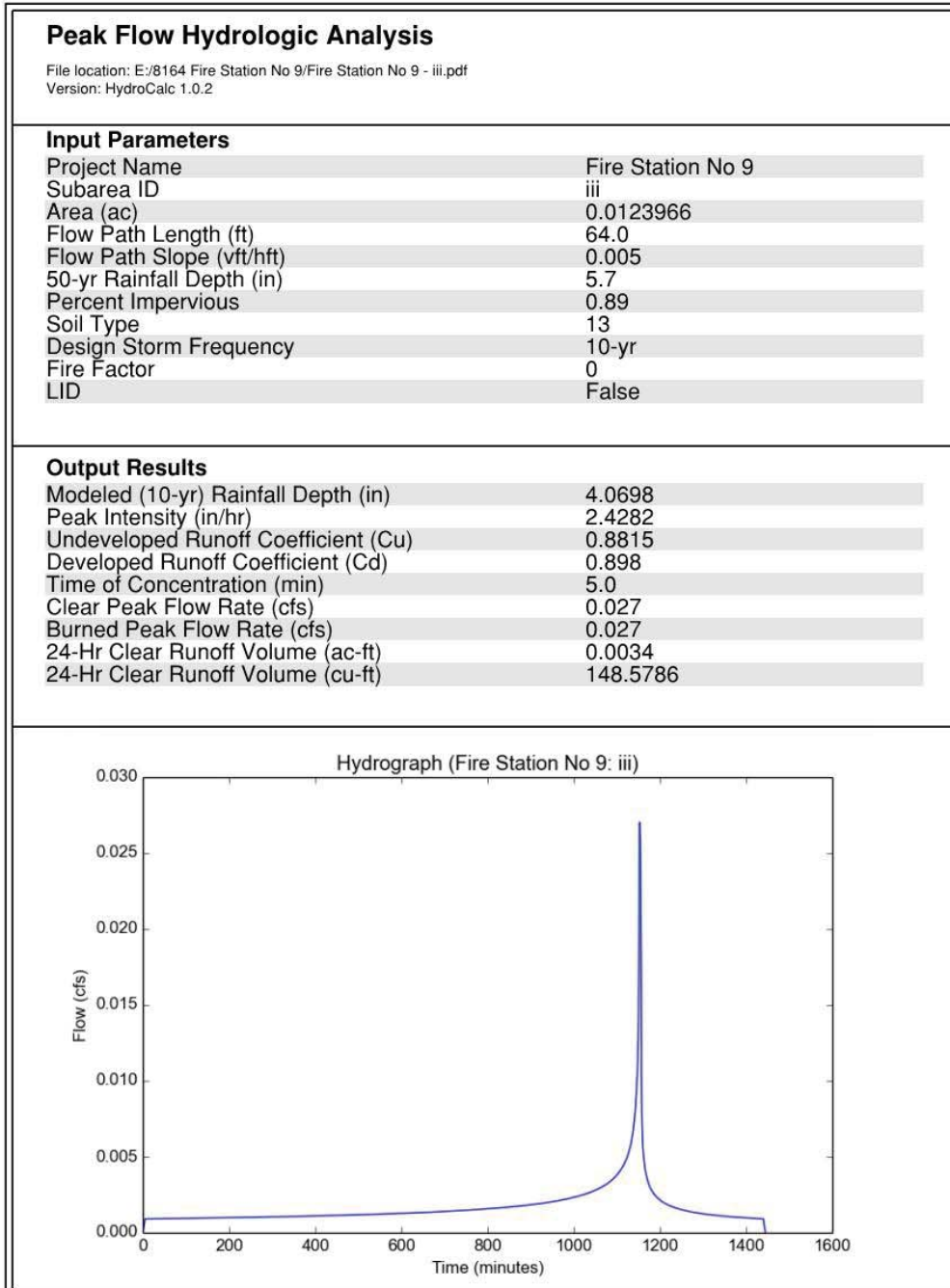
Input Parameters

Project Name	Fire Station No 9
Subarea ID	ii
Area (ac)	0.0709366
Flow Path Length (ft)	64.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0046
Peak Intensity (in/hr)	2.9859
Undeveloped Runoff Coefficient (Cu)	0.9258
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.1906
Burned Peak Flow Rate (cfs)	0.1906
24-Hr Clear Runoff Volume (ac-ft)	0.024
24-Hr Clear Runoff Volume (cu-ft)	1047.5293





Peak Flow Hydrologic Analysis

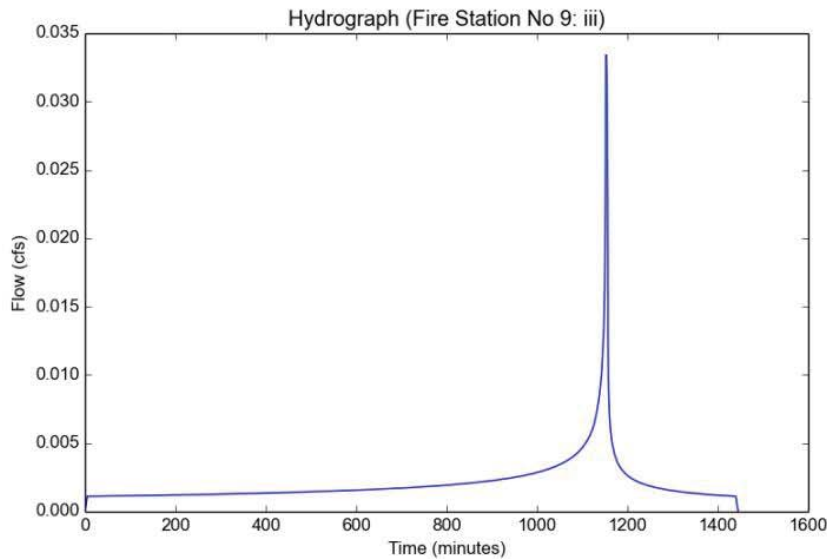
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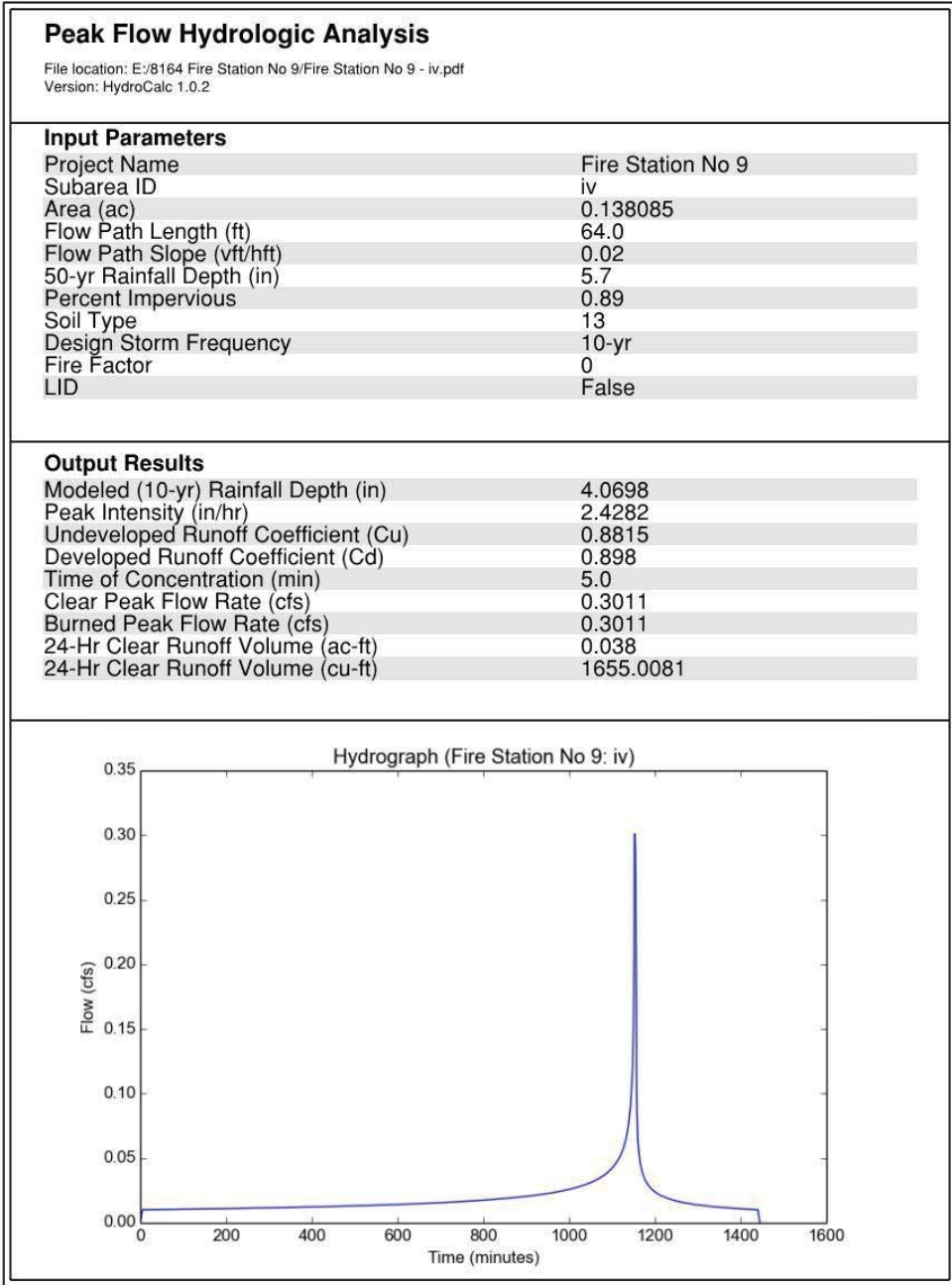
Input Parameters

Project Name	Fire Station No 9
Subarea ID	iii
Area (ac)	0.0123966
Flow Path Length (ft)	64.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0046
Peak Intensity (in/hr)	2.9859
Undeveloped Runoff Coefficient (Cu)	0.9258
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.0333
Burned Peak Flow Rate (cfs)	0.0333
24-Hr Clear Runoff Volume (ac-ft)	0.0042
24-Hr Clear Runoff Volume (cu-ft)	183.0621





Peak Flow Hydrologic Analysis

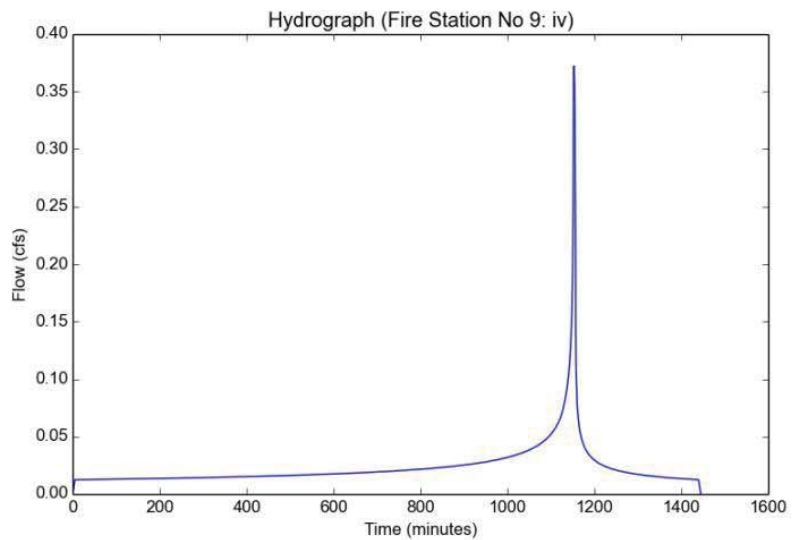
File location: E:\8164 Fire Station No 9\Fire Station No 9 - iv25.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	iv
Area (ac)	0.138085
Flow Path Length (ft)	64.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0046
Peak Intensity (in/hr)	2.9859
Undeveloped Runoff Coefficient (Cu)	0.9258
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.3711
Burned Peak Flow Rate (cfs)	0.3711
24-Hr Clear Runoff Volume (ac-ft)	0.0468
24-Hr Clear Runoff Volume (cu-ft)	2039.1178



Peak Flow Hydrologic Analysis

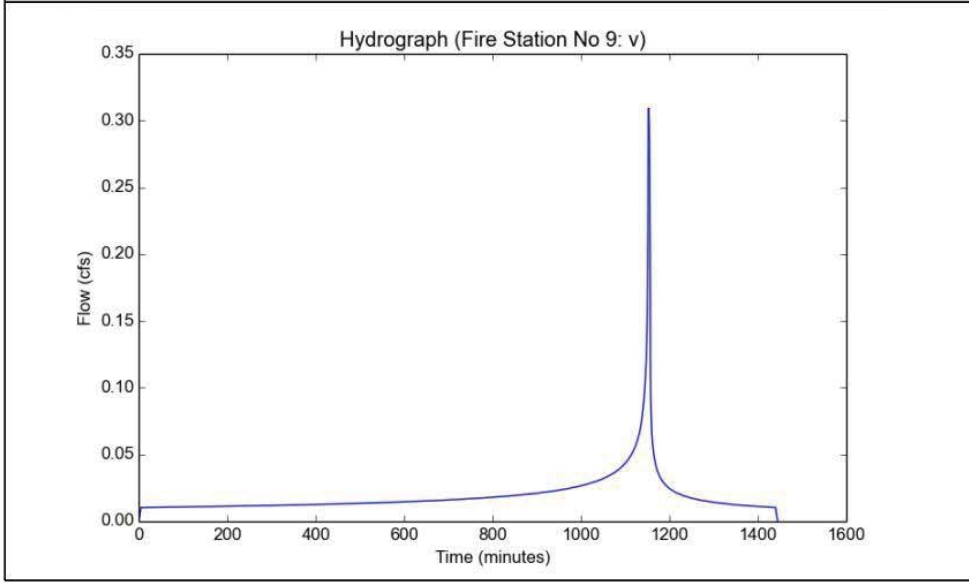
File location: E:\8164 Fire Station No 9\Fire Station No 9 - v.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	v
Area (ac)	0.141828
Flow Path Length (ft)	160.0
Flow Path Slope (vft/hft)	0.004
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.0698
Peak Intensity (in/hr)	2.4282
Undeveloped Runoff Coefficient (Cu)	0.8815
Developed Runoff Coefficient (Cd)	0.898
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.3092
Burned Peak Flow Rate (cfs)	0.3092
24-Hr Clear Runoff Volume (ac-ft)	0.039
24-Hr Clear Runoff Volume (cu-ft)	1699.8696



Peak Flow Hydrologic Analysis

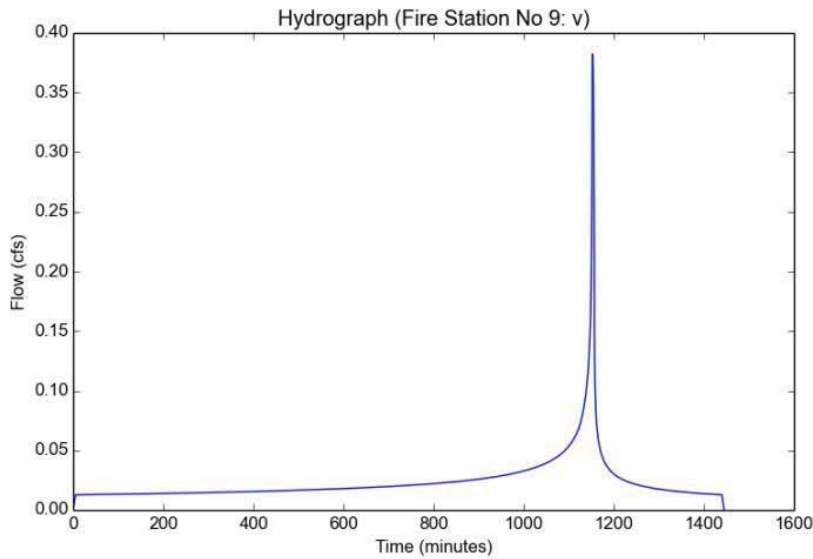
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Version: HydroCalc. 1.0.2

Input Parameters

Project Name	Fire Station No 9
Subarea ID	v
Area (ac)	0.141828
Flow Path Length (ft)	160.0
Flow Path Slope (vft/hft)	0.004
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.89
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0046
Peak Intensity (in/hr)	2.9859
Undeveloped Runoff Coefficient (Cu)	0.9258
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.3811
Burned Peak Flow Rate (cfs)	0.3811
24-Hr Clear Runoff Volume (ac-ft)	0.0481
24-Hr Clear Runoff Volume (cu-ft)	2094.3912



Section 4: BMP Selection |23

	Category 1 Screening (Feasible)	Category 2 Screening (Potentially Feasible)	Category 3 Screening (Infeasible)
Description	<input checked="" type="checkbox"/> Underlying Groundwater <input checked="" type="checkbox"/> Depth of bottom of infiltration facility to seasonal high groundwater is > 10 ft <input type="checkbox"/> Site Soils <input type="checkbox"/> Infiltration rate (K_{sat}) is > 0.5 in/hr <input type="checkbox"/> Geotechnical hazards <input checked="" type="checkbox"/> Site Surroundings <input checked="" type="checkbox"/> Buildings or structures are at least 25 ft away from the potential infiltration BMP <input checked="" type="checkbox"/> Site is not located within the designated hillside grading area. <input checked="" type="checkbox"/> No continuous presence of dry weather flows	1. Underlying Groundwater <input type="checkbox"/> Depth from bottom of infiltration facility to seasonal high groundwater is \leq 10 ft <input type="checkbox"/> Unconfined aquifer is present with beneficial uses that may be impaired by infiltration. Full treatment required if this is the case <input type="checkbox"/> Groundwater is known to be polluted. 2. Site Soils <input checked="" type="checkbox"/> Infiltration rate is \leq 0.5 in/hr but potential connectivity to higher K_{sat} soils is feasible <input type="checkbox"/> Geotechnical hazards such as liquefaction are a potential near the site 3. Site Surroundings <input type="checkbox"/> Buildings or structures are within 10 to 25 ft of the potential infiltration BMP <input type="checkbox"/> High-risk areas such as service/gas stations, truck stops, and heavy industrial sites. Full treatment is required if this is the case, or high-risk areas must be separate from stormwater runoff mingling	1. Underlying Groundwater <input type="checkbox"/> Depth from bottom of infiltration facility to seasonal high groundwater is \leq 5 ft <input type="checkbox"/> Sites with soil and/or groundwater contamination** Infiltration is not feasible 2. Site Soils <input checked="" type="checkbox"/> Infiltration rate is \leq 0.3 in/hr and connectivity to higher K_{sat} soils is infeasible <input checked="" type="checkbox"/> Geotechnical hazards such as liquefaction, collapsible soils, or expansive soils exist 3. Site Surroundings <input type="checkbox"/> Site is located on a fill site <input type="checkbox"/> Site is located on or within 50 feet upgradient of a steep slope (20% or greater) and has not been approved by a professional geotechnical engineer or geologist
Instructions	If all of the above boxes are checked, they shall be confirmed by a site-specific geotechnical investigation report and/or hydrologic analysis conducted and certified by a State of California registered professional geotechnical engineer or geologist, verifying that infiltration BMPs are feasible at the site*. Otherwise, proceed to Category 2 screening.	If all of the above boxes are checked, or if corresponding boxes in Category 1 are checked in combination with the above boxes, a site-specific geotechnical investigation report and/or hydrologic analysis conducted and certified by a State of California registered professional geotechnical engineer or geologist shall be carried out to approve infiltration measures*. Otherwise, proceed to Category 3 screening.	If any of the above boxes are checked, a site-specific geotechnical investigation report and/or hydrologic analysis conducted and certified by a State of California registered professional geotechnical engineer or geologist shall be submitted to prove infiltration practices are not feasible.*

Table 4.1: Infiltration Feasibility Screening

* Geotechnical Reports shall be reviewed by Building and Safety Bureau and Public Works Department. See Geotechnical Report Requirements herein.

** The presence of soil and/or groundwater contamination and/or the presence of existing or removed underground storage tanks shall be documented by CEQA or NEPA environmental reports, approved geotechnical reports, permits on file with the City, or a review of the State of California's Geotracker website.

Geotechnical Percolation Testing at 0.03"/hr and 0.13"/hr measured.

Section 4: BMP Selection |27

	Category 1 Screening (Feasible)	Category 2 Screening (Potentially Feasible)	Category 3 Screening (Infeasible)
Description	1. Landscaped Area <input type="checkbox"/> Landscaped area categorization of 1 exists in accordance with Table 4.3 <input type="checkbox"/> Captured volume equal to or less than the Estimated Total Water Usage (ETWU) from October 1 - April 30. 2. Site Soils <input type="checkbox"/> Geotechnical hazards are not a potential near the site 3. Vector Control <input type="checkbox"/> Approved vector control measures will be implemented	1. Landscaped Area <input type="checkbox"/> Landscaped area categorization of 2 exists in accordance with Table 4.3 <input checked="" type="checkbox"/> Captured volume greater than the Estimated Total Water Usage (ETWU) from October 1 - April 30. 2. Site Soils <input type="checkbox"/> Geotechnical hazards such as liquefaction are a potential near the site <input type="checkbox"/> Soil hydraulic conductivities are sufficient for the designed water application rate; if not, soil amendments will be implemented	1. Landscaped Area <input checked="" type="checkbox"/> Landscaped area categorization of 3 exists in accordance with Table 4.3 2. Site Soils <input checked="" type="checkbox"/> Geotechnical hazards such as landsliding, collapsible soils, or expansive soils exist 3. Site Surroundings <input type="checkbox"/> Site is located on or within 50 feet of a steep slope (20% or greater) as determined by the Department of Building and Safety; irrigation within 3 days of a rain event could cause geotechnical instability
Instructions	If all of the above boxes are checked, they shall be confirmed by a site-specific geotechnical investigation report and/or hydrologic analysis conducted and certified by a State of California registered professional civil engineer, geotechnical engineer, geologist, or landscape architect, verifying that capture and use BMPs are feasible at the site.* Otherwise, proceed to Category 2 screening.	If all of the above boxes are checked, or if corresponding boxes in Category 1 are checked in combination with the above boxes, a site-specific geotechnical investigation report and/or hydrologic analysis conducted and certified by a State of California registered professional civil engineer, geotechnical engineer, geologist, or landscape architect, shall be carried out to approve capture and use measures.* Otherwise, proceed to Category 3 screening.	If any of the above boxes are checked, a site-specific geotechnical investigation report and/or hydrologic analysis conducted and certified by a State of California registered professional geotechnical engineer, geologist, or landscape architect shall be submitted to prove capture & use practices are not feasible.*

Table 4.2: Capture and Use Feasibility Screening

* Geotechnical Reports shall be reviewed by the Building and Safety bureau and Public Works Department. See Geotechnical Report Requirements contained in the Infiltration Feasibility section.

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Table 4.3 has been created to help determine site feasibility for capture and use BMPs based on the local infiltration rate as well and the percent of the project that is landscaped. The table is to be used in conjunction with Table 4.2 to determine site feasibility.

Table 4.3: Landscaped Area Categorization

Local Infiltration Rate	Percent of Project that is Landscaped					
	0-5%	5-10%	10-20%	20-30%	30-50%	>50%
0.3 - 0.5 in/hr	2	2	2	1	1	1
0.2 - 0.3 in/hr	3	2	2	2	1	1
0.1 - 0.2 in/hr	3	3	2	2	2	1
0 - 0.1 in/hr	3	3	3	2	2	2

Assessing Site Capture and Use Feasibility

As with infiltration BMPs, assessing a site’s potential for implementation of capture and use BMPs requires both the review of existing information and the collection of site-specific information. Available information regarding the site’s landscaped area should be reviewed as discussed below. In addition, human health concerns should be prioritized, particularly with regards to vector control issues arising from the addition of standing water on site.

Landscaped Area Assessment

For capture and use BMPs, captured rainfall is stored during rain events and used for irrigation purposes at a later time, thereby offsetting potable water demand and reducing pollutant loading to the storm drain system. Therefore, sufficient landscaped area with appropriate water demand is needed for the captured runoff to be directed to. A properly sized cistern should be able to contain the runoff generated from the design storm event and discharge that water for irrigation use within a specified drawdown time.

In the City of Long Beach, cisterns will primarily be sized to capture the runoff generated from the 0.75 inch storm while meeting the drawdown time requirement. A site’s landscaped area must therefore be able to retain this volume of water within the appropriate drawdown time. Depending on the type of irrigation application that is desirable at a site, two different methods exist to determine if a site has adequate landscaped cover for capture and use feasibility:

1. For sites with sufficient agronomic demand to meet or exceed the captured supply of stormwater within the drawdown time, Category 1 Feasibility may apply. Agronomic demand must be calculated and reported by a professional landscape architect or qualified professional.
2. For sites with sufficient landscaped area and dispersal capacity (i.e. ability to receive irrigation water without generating runoff) to meet or exceed the captured supply of stormwater within the drawdown time, Category 2 Feasibility may apply. The dispersal capacity can be assumed to be equal to the infiltration capacity of the site

Calculating Size Requirements for Infiltration BMPs

The main challenge associated with infiltration BMPs is preventing system clogging and subsequent infiltration inhibition. In addition, infiltration BMPs must be designed to drain in a reasonable period of time so that storage capacity is available for subsequent storms and so that standing water does not result in vector risks or plant mortality. Infiltration BMPs should be designed according to the requirements listed and outlined in the text following.

Infiltration facilities must be sized to completely infiltrate the design capture volume within 48 hours. Steps for the simple sizing method are provided below.

Step 1: Calculate the Design Volume (v)

Infiltration facilities shall be sized to capture and infiltrate the design capture volume (V_{design}) based on the runoff produced from a 0.75-inch (0.0625 ft) storm event.

$$V_{design} \text{ (cu ft)} = 0.0625 \text{ (ft)} \times \text{Catchment Area (sq ft)}$$

Where:

$$\text{Catchment Area} = (\text{Impervious Area} \times 0.9) + [(\text{Pervious Area} + \text{Undeveloped Area}) \times 0.1]$$

For catchment areas given in acres, multiply the above equation by 43,560 sq. ft./acre.

$$CA = (14603 \times .9) + (1797 \times .1) = 13142.7 + 179.1 = 13322.4 \text{ SF.}$$

$$V_d = .0625 \times 13322.4 = 832.65 \text{ CF} < 833.33 \text{ CF Use per LA County HydroCalc. OK!}$$

Infiltration is Infeasible due to very low percolation rates.

ATTACHMENT B: GEOTECHNICAL INVESTIGATION

[Include all geotechnical documents relevant to infiltration feasibility (i.e. Geotechnical Report, Soils Report, Percolation Report, Soils Letter, etc.). The document(s) must detail the results of the soil investigation, the infiltration rate, groundwater depths, soil characterization, etc. Note that soil borings must be conducted in the area of the proposed BMPs. In addition to the complete soils report, a letter signed and stamped with wet ink application by a geotechnical engineer must be provided. The letter must state that the soil will or will not exhibit instability as a result of implementing the proposed BMPs, that the seasonal high groundwater depth is or is not at the required depth (5-10 feet depending on BMP type) below the base of the infiltration BMP, and the infiltration rate is or is not at least 0.3 in/hr.]

ATTACHMENT C: OPERATIONS AND MAINTENANCE (O&M) PLAN

[Include an Operations and Maintenance (O&M) Plan. This should include the components of the BMPs, the frequency of inspections and maintenance, the responsible entity, etc.]

Operations and Maintenance (O&M) Plan

For

Fire Station No 9

4101 Long Beach Boulevard

**Lot 36 And Portion Of Lot 37, Tract No 4493, Map Book 49, Page
38, Assessor's Parcel Number 7139-015-900 & 901**

OPERATIONS AND MAINTENANCE CERTIFICATION

I certify that the Low Impact Development (LID) Best Management Practices for this project will be operated and maintained per the Operations and Maintenance Plan herein. I acknowledge that all maintenance records will be documented made available for review upon request.

Responsible Party for Operations and Maintenance Name:	City of Long Beach, Marilyn Surakus		
Title:	Planner		
Department:	Planning & Building - Development Services		
Address:	411 E Ocean Boulevard, Long Beach, CA 90802		
Email:	Marilyn.Surakus@longbeach.gov		
Telephone No:	(562) 570-5793		
Signature:		Date:	

Low Impact Development Plan (LID Plan)

Fire Station No. 9

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes	S-1: Storm Drain Message and Signage	Yearly	Fire Department
No	S-2: Outdoor Material Storage Area Design		
Yes	S-3: Outdoor Trash Storage and Waste Handling Area Design	Monthly	Fire Department
No	S-4: Outdoor Loading/Unloading Dock Area Design		
No	S-5: Outdoor Repair/Maintenance Bay Design		
Yes	S-6: Outdoor Vehicle/Equipment/Accessory Washing Area Design	Monthly	Fire Department
No	S-7: Fueling Area Design		
Treatment Control BMPs			
Yes	Pre-treatment Media Insert	Quarterly	Fire Department
LID BMPs			
No	Not Applicable		
Hydromodification Control BMPs			
No	Not Applicable		

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Date of Maintenance and Inspection	BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed	Name of Personnel who Performed Maintenance and Inspection

ATTACHMENT D: PLANS

[Include full sized copies (24" x 36" or larger) of all relevant plans (i.e. grading plans, plumbing plans, drainage plans, etc.) signed, stamped, and dated with wet ink application by a California licensed civil engineer with all water quality notes and details. This is to properly evaluate the site design and ensure all BMPs are located on plans which will be used by the contractor during construction. The plans must indicate the locations of all BMPs, cross-sectional details of all BMPs, conveyance systems, drainage connections, overflow processes, elevations, inverts, etc. All conveyance systems (i.e. ribbon gutters, area drains, storm drains, swales, etc.) must be indicated with inverts and elevations. The cross-sectional details of the BMPs must show the type and depth of all layers (i.e. amended soil layer, gravel layer, etc.) and must follow the criteria from the design standard used.]

ABBREVIATIONS

ASANO	ABANDONED ASPHALT CONCRETE
ADJ	ADJUSTED
AFC	ALHAMBRA FOUNDRY COMPANY
ANC	ANCHOR
BGR	BEGIN CURB RETURN
BEG	BEGIN
BEG	BEGIN OF DRIVE
BM	BENCHMARK
BLDG	BUILDING
BK	BOTTOM OF X
BK	BOTTOM OF GUTTER
CAS	CRUSHED ANTI-CORROSE BASE
CAS	CATCH BASIN
CD	CURB DRAIN
CL-€	CENTERLINE
CLP	CAST IRON PIPE
CLP	CANAL
COLR, CLB	CRUSHED MISCELLANEOUS BASE
C.O.C.	CITY OF LONG BEACH
C.O.C.	CLEAN OUT
CON	CONSTRUCTION
CONT.	CONTROLLER
DR	DRIVER
DWR	DRAWING
DWY	DRIVEWAY
E/CURB	EAST OF CURB
EP	EDGE OF PAVEMENT
EX	EXISTING
FF	FINISHED FLOOR
FG	FINISH GRADE
FL	FLOWLINE
FS	FINISHED SURFACE
GB	GRADE BREAK
GUT	GUTTER
GS	GAS SERVICE
H-XXXX	HOUSE MAP NUMBER
HWY	HIGHWAY
IN	INCHES
INV	INVERT
L	LENGTH
LBT	LONG BEACH TRANSIT
LBER	LONG BEACH ENERGY RESOURCE
LWBD	LONG BEACH WATER DEPARTMENT
MAX	MAXIMUM
MIN	MINIMUM
OC	ORANGE CURVE
MFA	METROPOLITAN TRANSPORTATION AUTHORITY
N	NORTH
NE	NORTHEAST
NO.	NUMBER
NGVD	NATIONAL GEODETIC VERTICAL DATUM
N'LY	NORTHERLY
PCC	PORTLAND CEMENT CONCRETE
PP	POWER POLE
P/L	PROPERTY LINE
PT	POINT
POR	PORTION
PRC	POINT OF REVERSE CURVE
PROD	PRODUCED
PVMT	PAVEMENT
R	RADIUS
R#	RATE
RDIP	ROOF DRAIN
RIP	ROOF DRAIN CAST IRON PIPE
R.O.W.	RIGHT-OF-WAY
R/W	RIGHT-OF-WAY LINE
S	SOUTH
S'LY	SOUTHERLY
SCE	SOUTHER CALIFORNIA EDISON
SE	SOUTHEAST
SF	SQUARE FOOT
SHT	STREET LIGHT
SLT	SLIGHT
STD	STANDARD
STL	STEEL
STG	SET TO GRADE / RECONSTRUCT TO FS. GRADE
SW	SOUTHWEST PLANS FOR PUBLIC CONSTRUCTION
SPFFWC	SPFFWC
TC	TOP OF CURB
TL	TRUE LENGTH
TS	TRAFFIC SIGNAL
TSS	TRAFFIC SIGNAL VARIABLE
VAR	VARIABLE
VCP	VITRIFIED CLAY PIPE

ABBREVIATIONS

W	WIDTH
WS	WATER SERVICE
WDS	WATER DEPARTMENT STANDARDS
- -	- -
- -	- -
- -	- -

SYMBOL LEGEND

— — — —	RIGHT-OF-WAY LINE
—	PROPERTY LINE
—	CENTERLINE
X	CHANLINK FENCE
—(E)—	EXISTING ELECTRICAL
—(G)—	EXISTING GAS
—(S)—	EXISTING SEWER
—(W)—	EXISTING WATER
—	SEWER LINE
—	FIRE SERVICE
—	WATER LINE
—	BENCH MARK
○	BOLLARD
—	FIRE HYDRANT
—	POWER POLE
—	EXISTING GRADE
—	PULL BOX
—	PROPOSED GRADE
—	MANHOLE
—	SEWER
—	STORM DRAIN
E / SCE	SOUTHERN CALIFORNIA EDISON
SL	STREET LIGHT POLE
—	TELEPHONE
—	WATER METER
—	GAS METER
—	METER
—	WATER VALVE
—	TRAFFIC SIGNAL POLE

DEMOLITION LEGEND

■	REMOVE PCC PAVEMENT.
■	REMOVE AC PAVEMENT.
1	REMOVE AC PAVEMENT.
2	REMOVE PCC PAVEMENT.
4	REMOVE PCC CURB.
5	REMOVE EXISTING STREET TREE.
6	REMOVE EXISTING BUILDING.
7	PROTECT EXISTING BUILDING.
8	PROTECT IN PLACE STREET LIGHT POLE.
9	PROTECT EXISTING POWER POLE.
10	PROTECT IN PLACE PCC SIDEWALK.
11	REMOVE EXISTING ABANDONED WATER METER.
12	PROTECT IN PLACE EXISTING STREET SIGN.
13	PROTECT IN PLACE EXISTING WATER METER.
14	PROTECT EXISTING SEWER MANHOLE.
15	PROTECT EXISTING PULL BOX.

CONSTRUCTION LEGEND

- PROTECT EXISTING PCC PAVEMENT.
- PROTECT EXISTING WALL.
- PROTECT EXISTING FIRE HYDRANT.
- REMOVE EXISTING STREET SIGN.
- RELOCATE EXISTING UTILITY PULL BOX
- REMOVE EXISTING UTILITY POLE
- CUT AND CAP ABANDONED SEWER LATERAL.

DEMOLITION LEGEND

- REMOVE PCC PAVEMENT OVER 6" CMB PER TYPICAL SECTION ON SHEET 30/05.
- CONSTRUCT PCC 8" THICK CROSS GUTTER OVER 6" CMB PER SPFFWC PLAN No. 122-3.
- CONSTRUCT PCC PARKWAY DRAIN PER SPFFWC STANDARD PLAN No. 151-3, INLET TYPE 2.
- CONSTRUCT FIRE HYDRANT PER LEWD STANDARD WDS-1022
- REMOVE AC PAVEMENT.
- REMOVE PCC PAVEMENT.
- REMOVE PCC CURB.
- REMOVE EXISTING STREET TREE.
- REMOVE EXISTING BUILDING.
- PROTECT EXISTING BUILDING.
- PROTECT IN PLACE STREET LIGHT POLE.
- PROTECT EXISTING POWER POLE.
- PROTECT IN PLACE PCC SIDEWALK.
- REMOVE EXISTING ABANDONED WATER METER.
- PROTECT IN PLACE EXISTING STREET SIGN.
- PROTECT IN PLACE EXISTING WATER METER.
- PROTECT EXISTING SEWER MANHOLE.
- PROTECT EXISTING PULL BOX.

ABBREVIATIONS

W	WIDTH
WS	WATER SERVICE
WDS	WATER DEPARTMENT STANDARDS
- -	- -
- -	- -
- -	- -

CONSTRUCTION LEGEND

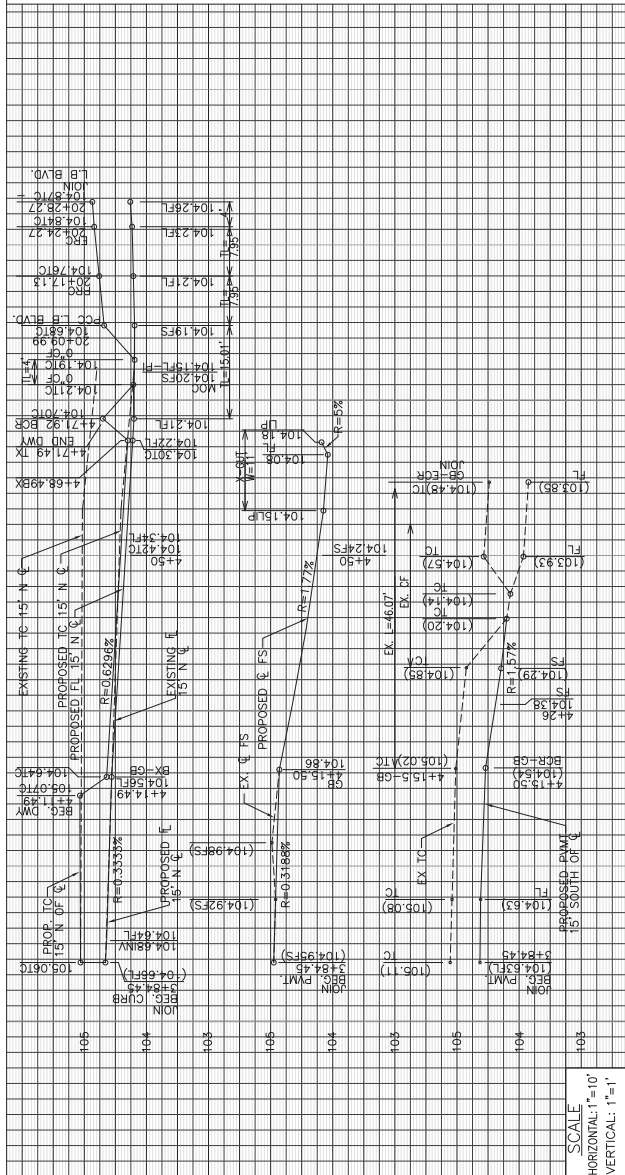
- CONSTRUCT PCC PAVEMENT.
- CONSTRUCT PCC CURB AND GUTTER PER SPFFWC STANDARD PLAN No. 120-3, TYPE A2-6" TYPE A2-8"(200mm), W=MATCH EX., AND PER COLB STANDARD PLAN No. 107 AND NO. 116, OVER 6" CMB.
- CONSTRUCT 3"-THICK PCC SIDEWALK PER COLB STANDARD, PLAN No. 107 & SPFFWC STANDARD PLAN No. 112-2, OVER 4" CMB.
- CONSTRUCT 1'-FOOT-WIDE FULL-DEPTH AC SLOT PAVING PER COLB STANDARD PLAN No. 116.
- CONSTRUCT ALLEY INTERSECTION PER COLB STANDARD PLAN No. 105.
- CONSTRUCT PARKWAY PER LANDSCAPE PLANS, SHEET L2.0
- CONSTRUCT TYPE 1 PCC DRIVEWAY 8" THICK PER COLB STANDARD, PLAN No. 105 AND DETAIL OVER 6" CMB.
- CONSTRUCT PCC CURB RAMP PER COLB STANDARD, PLAN No. 122, TYPE CASE AND DETAIL ON SHEET 28/03, OVER 6" CMB.
- CONSTRUCT CURB DRAIN PER SPFFWC STANDARD PLAN No. 150-4, CASE 1 INLET.
- CONSTRUCT PCC CURB PER SPFFWC STANDARD, PLAN No. 120-3, TYPE A1-6.
- PLANT TREE, PER LANDSCAPE PLAN SHEET No. L2.0 - 24 INCH BOX PER COLB STANDARD PLAN No. 502, 504 AND 416.
- CONSTRUCT RCIP PER #C STANDARD PLAN No. A-470 & A-480.
- CONSTRUCT 8"-THICK PCC ALLEY PER COLB STANDARD PLAN No. 107.
- CONSTRUCT DETECTABLE WARNING PER COLB STANDARD PLAN No. 122
- FURNISH AND INSTALL FIRE SERVICE PER LEWD DRAWINGS EO-XXXX.
- FURNISH AND INSTALL WATER METER PER LEWD STANDARD PLAN WDS 001 & WDS 002.
- FURNISH AND INSTALL SEMER LATERAL PER LEWD STANDARD PLAN No. WDS 404 & WDS 506.
- FURNISH AND INSTALL GAS SERVICE BY LONG BEACH ENERGY RESOURCES.
- CONSTRUCT 8" PCC PAVEMENT OVER 6" CMB PER TYPICAL SECTION ON SHEET 30/05.
- CONSTRUCT PCC 8" THICK CROSS GUTTER OVER 6" CMB PER SPFFWC PLAN No. 122-3.
- CONSTRUCT PCC PARKWAY DRAIN PER SPFFWC STANDARD PLAN No. 151-3, INLET TYPE 2.
- CONSTRUCT FIRE HYDRANT PER LEWD STANDARD WDS-1022



NO.	DATE	DESCRIPTION	APPROVAL	REVISIONS

DESIGNED BY:	Barbara Ashba
DRAWN BY:	Barbara Ashba
CHECKED BY:	ME
DESIGN CHECKED BY:	ME
DATE:	12/19/2021
PROJECT NO.:	3005010108
PHASE #:	/REVISION #
SHEET	27 / 22 OF 229
DWG. NO.:	C-66916

OFF-SITE IMPROVEMENT PLAN
ABBREVIATION, SYMBOLS, DEMOLITION
AND CONSTRUCTION NOTES

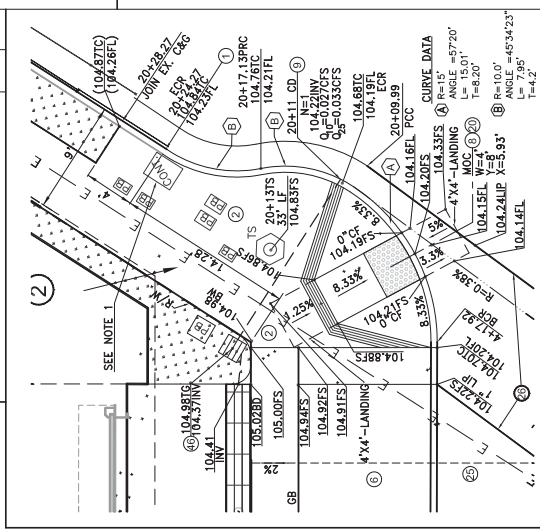


CONSTRUCTION NOTES

1. CONSTRUCT PCC CURB AND GUTTER PER SFFPMC STANDARD PLAN NO. 120-3, TYPE A2-6" OVER 6" CMB. REMOVE EX. AND PER COLB STANDARD PLAN NO. 107 AND NO. 116.
2. CONSTRUCT 3"-THICK PCC SIDEWALK PER COLB STANDARD. PLAN NO. 107 & SFFPMC STANDARD PLAN NO. 112-2, OVER 4" CMB.
3. CONSTRUCT 1'-FOOT-WIDE FULL-DEPTH AC SLOT PAVING PER COLB STANDARD. PLAN NO. 105 AND DETAIL OVER 6" CMB.
4. CONSTRUCT PCC CURB RAMP TYPE 1 PER COLB STANDARD PLAN NO. 122 AND DETAIL ON SHEET 28/C3.
5. CONSTRUCT CURB DRAIN PER SFFPMC STANDARD PLAN NO. 150-4, CASE 1 INLET.
6. CONSTRUCT PCC CURB PER SFFPMC STANDARD. PLAN NO. 120-3, TYPE A1-6.
7. CONSTRUCT DETECTABLE WARNING PER COLB STANDARD PLAN NO. 122.
8. FURNISH AND INSTALL FIRE SERVICE PER LEWD DRAWINGS EO-XXXX.
9. FURNISH AND INSTALL WATER METER PER LEWD STANDARD PLAN WDS 001 & WDS 002.
10. CONSTRUCT 8" PCC PAVEMENT OVER 6" CMB PER TYPICAL SECTION ON SHEET 30/C5.
11. CONSTRUCT PCC 8" THICK CROSS GUTTER OVER 6" CMB PER SFFPMC PLAN NO. 122-3.
12. CONSTRUCT FIRE HYDRANT PER LEWD DRAWINGS EO-XXXX.
13. CONSTRUCT DROP INLET-SEE GRADING SHEET.
14. REMOVE AC PAVEMENT.
15. REMOVE PCC PAVEMENT.
16. REMOVE PCC CURB.
17. REMOVE PCC DRIVEWAY AND APPROACH.
18. PROTECT IN PLACE STREET LIGHT POLE.
19. PROTECT EXISTING POWER POLE.
20. PROTECT IN PLACE PCC SIDEWALK.
21. PROTECT EXISTING PCC PAVEMENT.
22. REMOVE EXISTING STREET SIGN

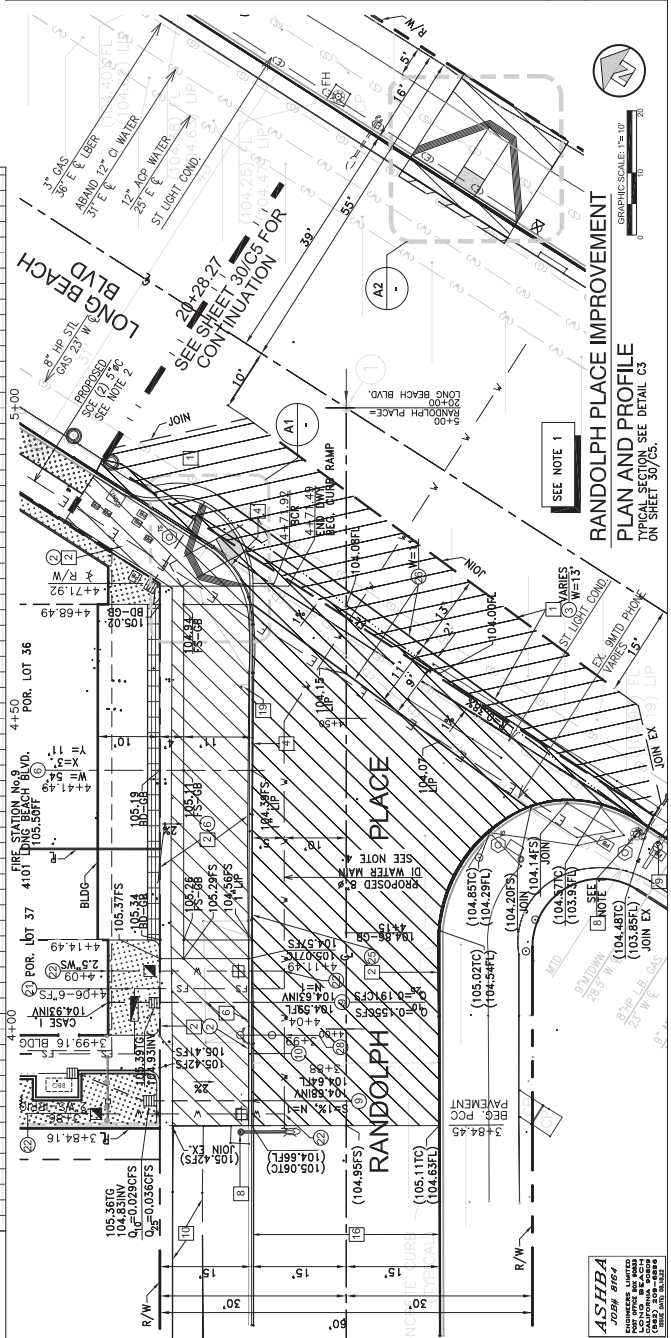
NO.	DATE	DESCRIPTION	APPROVAL
1	12/16/2022	PLAN CHECK SUBMITTAL - B&P	
2	04/22/2023	PLAN CHECK RE-SUBMITTAL - B&P	

DESIGNED BY: Barbara Akiba
 DRAWN BY: Barbara Akiba
 CHECKED BY: REF.
 DESIGNED BY: REF.
 DRAWN BY: REF.
 CHECKED BY: REF.



PROJECT NO.	3005010108
PHASE #	1 / REVISION #
SHEET	28 / C3 OF 229
DWG. NO.	C-6616

PROJECT NO. 3005010108
 PHASE # 1 / REVISION #
 SHEET 28 / C3 OF 229
 DWG. NO. C-6616

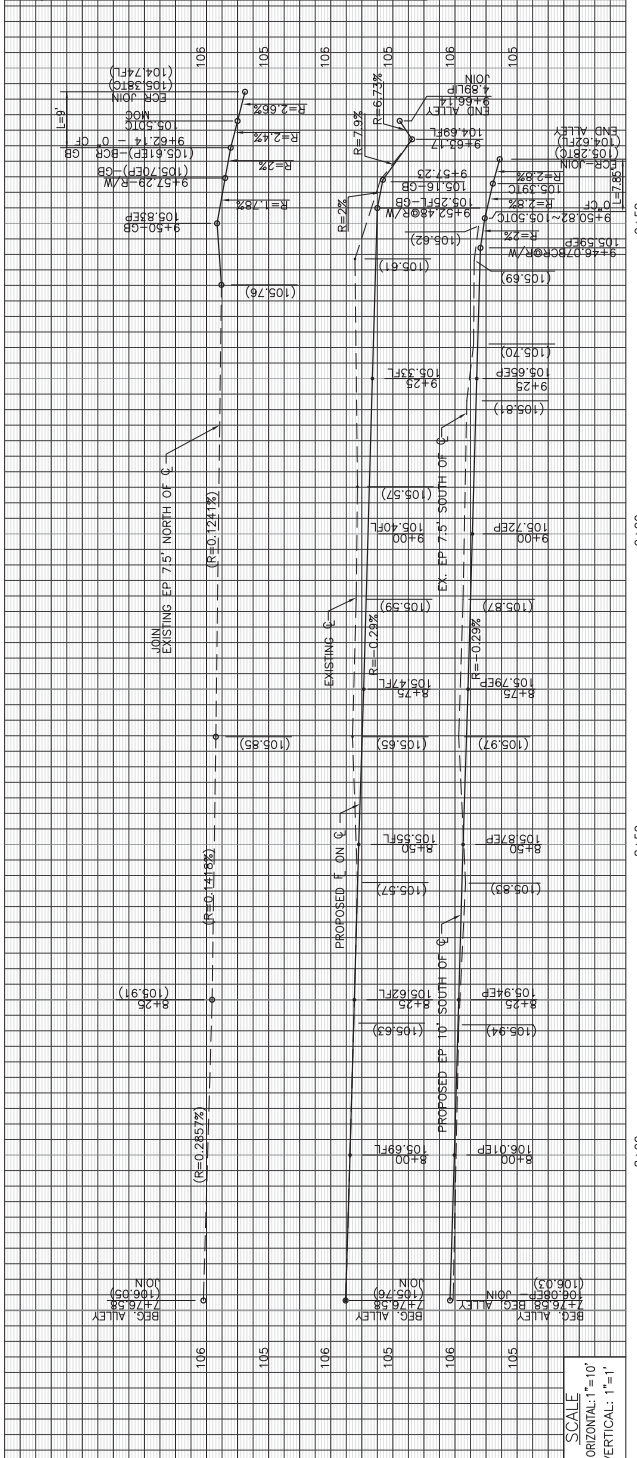


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 Sacramento, CA 95814
 (916) 441-1111
 www.aspha.com

FILE INFO: E:\aspha Engineers Ltd\8164 CLB FS No. 9 - MMA\Working\3. Street Plan - Randolph - 8164.dwg

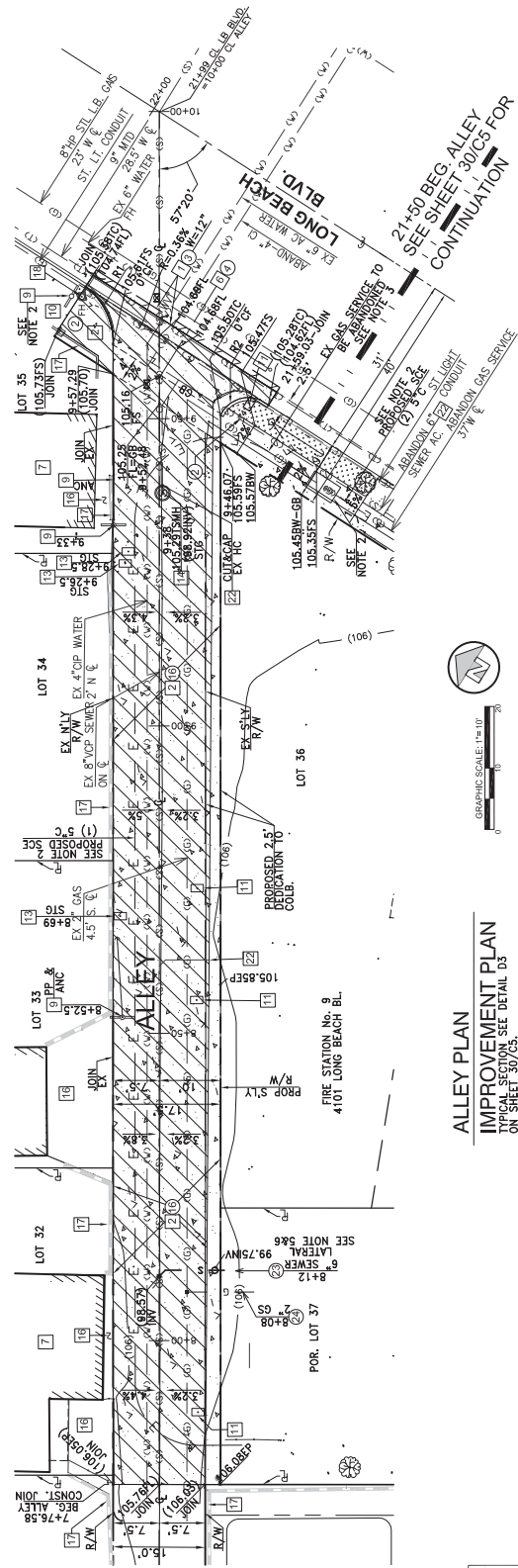
CONSTRUCTION NOTES

2. CONSTRUCT 4" THICK PCC SIDEWALK PER COLB STANDARD OVER 4" CMB. & SETTING STANDARD PLAN NO. 112-2.
 3. CONSTRUCT ALLEY INTERSECTION PER COLB STANDARD PLAN NO. 106.
 4. CONSTRUCT 8" THICK PCC ALLEY PER COLB STANDARD PLAN NO. 107 OVER 4" CMB. PER SECTION D3 ON 30/05.
 5. FURNISH AND INSTALL SEWER LATERAL PER LEMO STANDARD PLAN No. WDS 404 & WDS 506 AND SEPARATE LEMO PLANS. ENERGY REQUISITE GAS SERVICE BY LONG BEACH ENERGY SERVICES.
 6. REMOVE AC PAVEMENT.
 7. REMOVE PCC PAVEMENT.
 8. REMOVE PCC DRIVEWAY AND APPROACH.
 9. PROTECT EXISTING BUILDING.
 10. PROTECT EXISTING POWER POLE.
 11. PROTECT IN PLACE PCC SIDEWALK.
 12. REMOVE EXISTING ABANDONED WATER METER.
 13. PROTECT IN PLACE EXISTING WATER METER.
 14. PROTECT EXISTING SEWER MANHOLE.
 15. PROTECT EXISTING PULL BOX.
 16. PROTECT EXISTING PCC PAVEMENT.
 17. PROTECT EXISTING WALL.
 18. PROTECT EXISTING FIRE HYDRANT.
 19. CUT AND CAP ABANDONED SEWER LATERAL PER SEPARATE LEMO PLAN.
- NOTES:
1. SEE TRAFFIC SIGNAL PLANS FOR ADDITIONAL INFORMATION.
 2. SEE SEPARATE PLANS FOR 32/07, & 33/08.
 3. CONTACT UBER FOR ALL WORK ON GAS.
 4. SEE SEPARATE LEMO DWGS FOR WATER MAIN CONSTRUCTION.
 5. SEE SEPARATE PLUMBING PLANS SHTS 17/20 & 17/21.
 6. SEE SEPARATE ON SITE UTILITY PLAN SHT. 22/0010.



SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=1'

CURVE DATA
P1=9.0'
ANGLE=57.20°
T=5.00'
L=9.005'
L=9.005'



ALLEY PLAN
IMPROVEMENT PLAN
TYPICAL SECTION SEE DETAIL D3
ON SHEET 30/05.

ASHRA
1024 8674
REGISTERED PROFESSIONAL ENGINEER
CIVIL ENGINEERING
STATE OF CALIFORNIA
C.E.P. 1024 8674

NO.	DATE	SHEET	APPROVAL	DESCRIPTION	REVISIONS
1	12/16/2021	1	Barbara Akiba	DESIGN CHECK SUBMITTAL - B&P	
2	04/22/2022	1	Barbara Akiba	PLAN CHECK SUBMITTAL - B&P	

DESIGNED BY:
Barbara Akiba

DRAWN BY:
MEF

CHECKED BY:
MEF

AS-BUILT
Barbara Akiba

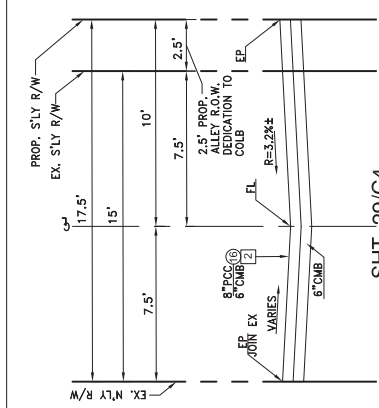
PROJECT NO.
3005010108

PHASE #
/ REVISION #

SHEET
29 / C4 OF 229

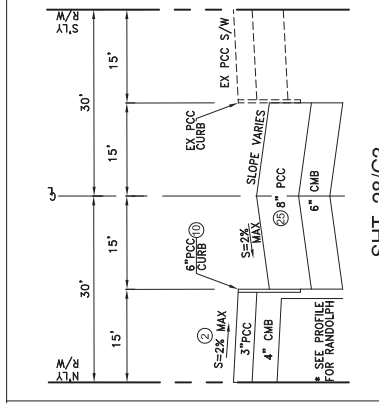
DWG. NO.
C-6616

ALLEY PLAN IMPROVEMENT AND PROFILE PLAN



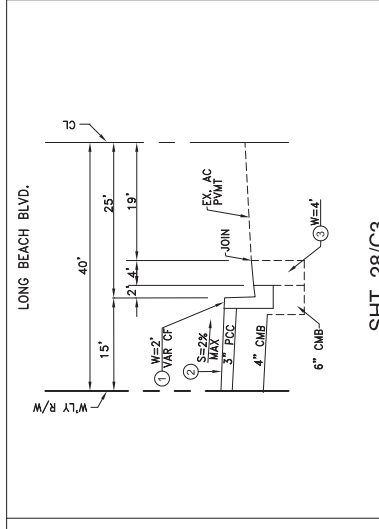
SHT. 29/C4

TYPICAL SECTION - ALLEY



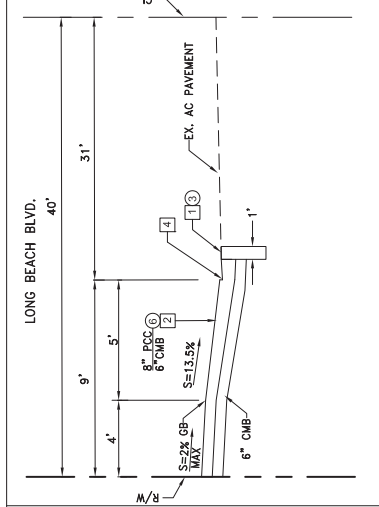
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TYP. SECTION RANDOLPH



SHT. 28/C3

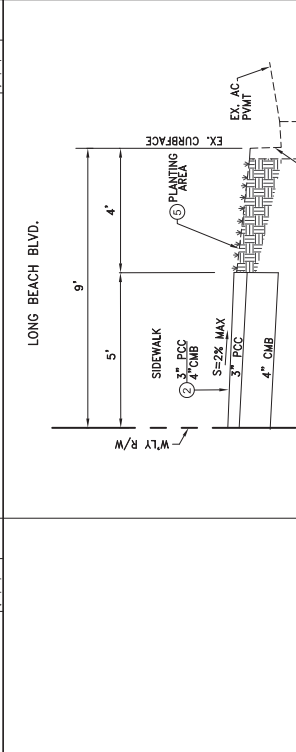
TYP. SECTION @ 20+09.99 PCC



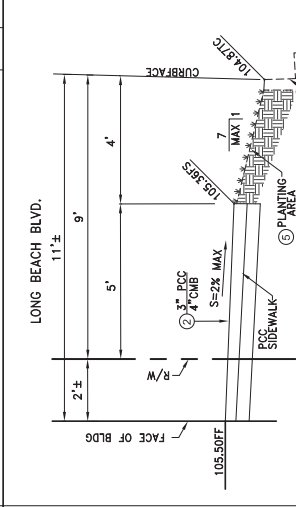
TYP. SECTION @ DRIVEWAY 21+24.93

- 1 CONSTRUCT PCC CURB AND GUTTER PER SFPFMC STANDARD PLAN NO. 120-3, TYPE A2-6" OVER 6" CMB EX. AND PER COLB STANDARD PLAN NO. 107 AND NO. 116.
- 2 CONSTRUCT 3"-THICK PCC SIDEWALK PER COLB STANDARD. PLAN NO. 107 & SFPFMC STANDARD PLAN NO. 112-2, OVER 4" CMB.
- 3 CONSTRUCT 1'-FOOT-WIDE FULL-DEPTH AC SLOT PAVING PER COLB STANDARD PLAN NO. 116.
- 4 CONSTRUCT PARKWAY PER LANDSCAPE PLANS, SHEET L2.0
- 5 CONSTRUCT TYPE 1 PCC DRIVEWAY 8" THICK PER COLB STANDARD. PLAN NO. 105 AND DETAIL.
- 6 CONSTRUCT CURB DRAIN PER SFPFMC STANDARD PLAN NO. 150-4, CASE I INLET.
- 7 CONSTRUCT PCC CURB PER SFPFMC STANDARD. PLAN NO. 120-3, TYPE A1-6.
- 8 PLANT TREE PER LANDSCAPE PLAN SHEET NO. L2.0 - 24 INCH BOX PER COLB STANDARD PLAN NO. 502, 504 AND 416.
- 9 CONSTRUCT 8"-THICK PCC ALLEY PER COLB STANDARD PLAN NO. 107.
- 10 CONSTRUCT 8" PCC PAVEMENT OVER 6" CMB PER TYPICAL SECTION ON SHEET 28/C3.
- 11 CONSTRUCT PCC PARKWAY DRAIN PER SFPFMC STANDARD PLAN NO. 151-3, INLET TYPE 2.
- 12 REMOVE AC PAVEMENT.
- 13 REMOVE PCC PAVEMENT.
- 14 REMOVE PCC CURB.
- 15 REMOVE EXISTING STREET TREE.
- 16 PROTECT IN PLACE STREET LIGHT POLE.
- 17 RELOCATE EXISTING UTILITY PULL BOX
- 18 REMOVE EXISTING UTILITY POLE.

CONSTRUCTION NOTES

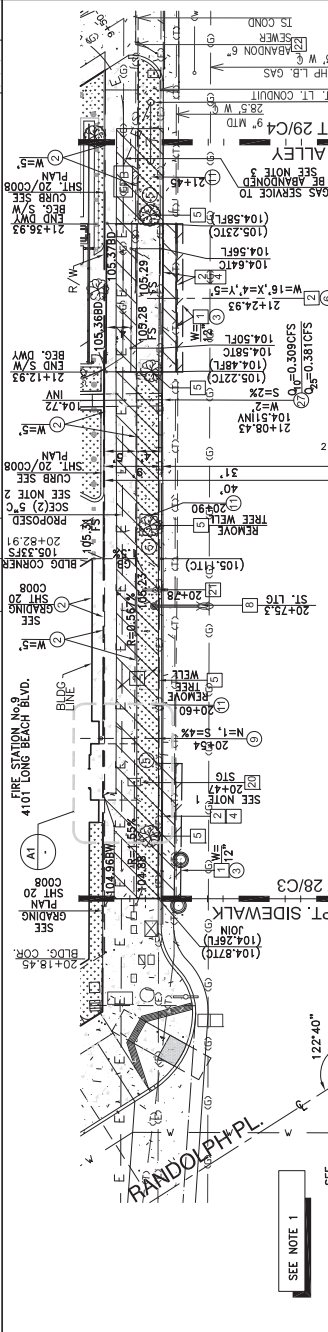


TYP. SECTION SIDEWALK



TYP. SECTION @ ENTRANCE - 20+49±

CONSTRUCTION NOTES



ENTRANCE DETAIL @ LONG BEACH BLVD. A1

1. SEE TRAFFIC SIGNAL PLANS FOR ADDITIONAL INFORMATION AND LOCATION
2. SEE PLUMBING PLANS FOR UNDERGROUND CONSTRUCTION
3. SEE ON SITE UTILITY PLAN
4. CONTACT LBER FOR ALL WORK ON GAS

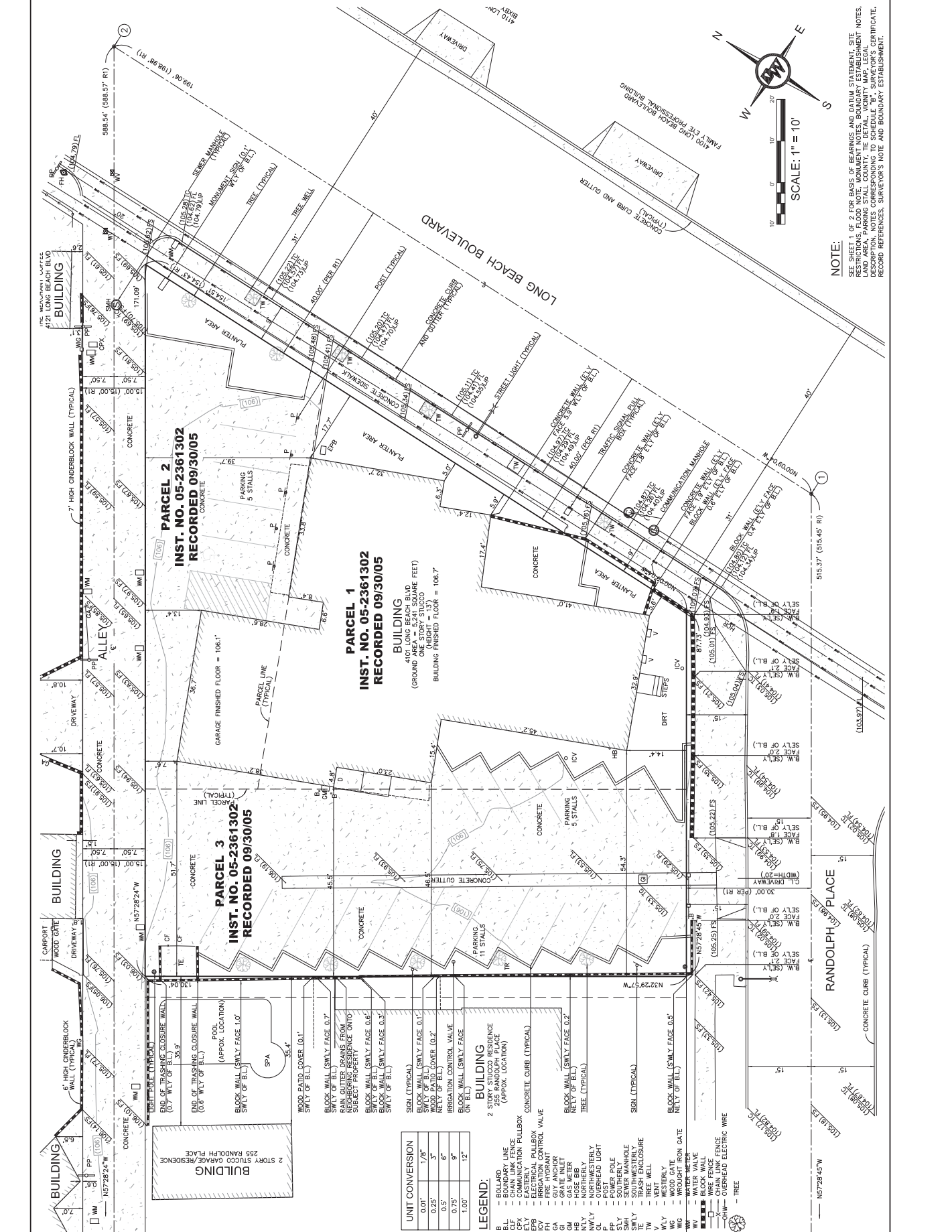
NOTES:



LONG BEACH BOULEVARD

GRAPHIC SCALE 1"=10'

PROJECT NO. 3005010108
 PHASE # / REVISION #
 SHEET 30 / C5 OF 229
 DWG. NO. C-6616



NOTE:
 SEE SHEET 1 OF 2 FOR BASIS OF BEARINGS AND DATUM STATEMENT, SITE LOCATION, SURVEY METHOD AND INSTRUMENT NOTES. THIS IS A PRELIMINARY SURVEY. LAND AREA, PARKING STALL COUNT, THE DETAIL VOLUME MAP, LEGAL DESCRIPTION, NOTES CORRESPONDING TO SCHEDULE "B", SURVEYOR'S CERTIFICATE, RECORD REFERENCES, SURVEYOR'S NOTE AND BOUNDARY ESTABLISHMENT.

BASIS OF BEARINGS & DATUM STATEMENT:
(PURSUANT TO THE CALIFORNIA PUBLIC RESOURCE CODE, SECTIONS 8811, 8812, 8813, 8815.1, 8866 & 8867)

THE BEARINGS AND HORIZONTAL COORDINATES SHOWN HEREIN ARE BASED ON THE NETWORK (GLTRN) STATIONS REFERRED TO AS LOT 7 AND PUD7. DATA FOR SAID STATIONS WERE OBTAINED FROM THE BEACH DEPARTMENT OF ENERGY SERVICES (LBER) AND THE CLERK POSITIONS WERE FIELD CHECKED/VERIFIED IN THIS SURVEY.

THE UTM GRID BEARING FROM THE CLERK POSITIONS TO SAID LOT 7 AND PUD7 BEING PUBLISHED BY THE CALIFORNIA SPATIAL REFERENCE CENTER (C.S.R.C.) ON JANUARY 18, 2007, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

THE ORTHOMETRIC ELEVATIONS SHOWN HEREIN ARE BASED ON CITY OF LONG BEACH BENCHMARK NO. 368 ELEVATION = 104.150 (NVD 1929)

THE SURVEY DEPARTMENT AS FOLLOWS:

BRASS BOUNDS IN CATCH BASIN STAMPED: VERTICAL CONTROL MARK NATIONAL GEODETIC INTERSECTION OF LONG BEACH BOULEVARD AND MARSHALL PLACE

BENCHMARK NO. 368 ELEVATION = 104.150 (NVD 1929)

ALL VALUES ARE EXPRESSED IN U.S. SURVEY FEET

(1 FOOT = 1200/3937 METERS).

ALL COORDINATES SHOWN HEREIN ARE SHOWN HEREIN ARE GRID DISTANCES. NO OTHER DISTANCES.

NO OTHER DISTANCES.

NO OTHER DISTANCES.

NO OTHER DISTANCES.

GRID AND GROUND DISTANCES ARE THE SAME UP TO 200.00 FEET.

SITE RESTRICTIONS:

- 10 FT
- 10 FT
- 10 FT
- 20 FT
- 5 FT
- 28 FT/2 STORES
- CCA (COMMUNITY COMMERCIAL)
- AUTOMOBILE-ORIENTED
- (PLANNING DEPARTMENT)

CONTRACT NUMBER - 662, 570-6184

MAP NO. 06038 1955 F RECORDED SEPTEMBER 26, 2008

ZONE "X" PER FEDERAL EMERGENCY MANAGEMENT AGENCY

THE ABOVE STATEMENT IS FOR INFORMATION ONLY AND THIS SURVEYOR ASSUMES NO LIABILITY FOR THE CORRECTNESS OF THE CITED MAP(S). IN OPINION OF THE PROBABILITY OF FLOODING.

FLOOD NOTE:

TRACT NO. 4403

MONUMENT NOTES:

- 1 FOUND MAG NAIL AND BRASS WASHER STAMPED "LS 6970" PER P.M.F.B. ASPHALT.
- 2 FOUND MAG NAIL AND BRASS WASHER STAMPED "LS 6970" PER P.M.F.B. ASPHALT.
- 3 FOUND PUNCHED 2 1/2 BRASS DISK STAMPED "MON. NO. 8544" SET ON AS C.L.R. MONUMENT 8544 PER R.S.B. 217/097.
- 4 SEARCHED, FOUND NOTHING AT CONTRIBUTE INTERSECTION, ESTABLISHED PER FOUND TIES PER CITY OF LONG BEACH THE BOOK L-71-38. SEE THE INDICATES GEAR SPIKE AND STEEL WASHER STAMPED "LS 8862" TO BE SET UPON RECONSTRUCTION OF RECORD OF SURVEY.

BOUNDARY ESTABLISHMENT NOTES:

- A SEARCHED, FOUND NOTHING, ESTABLISHED BY PROKATION PER TRACT NO. 4403, M.B. 49/28 RT.
- B SEARCHED, FOUND NOTHING, ESTABLISHED BY INTERSECTION.

PARKING STALLS:

- 21 STANDARD PARKING STALLS
- 1 HANDICAPPED PARKING STALL

LAND AREA:

16.829 SQUARE FEET
0.386 ACRES

TIE DETAIL
SCALE: 1"=20'



LEGAL DESCRIPTION:

THE LEGAL DESCRIPTION CITED BELOW WAS TAKEN FROM THE TITLE REPORT REFERENCED HEREON.

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL 1: PORTION OF APN: 7139-015-017

THAT PORTION OF LOT 36 OF TRACT NO. 4493, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 49, PAGE 28 OF THE PUBLIC RECORDS OF SAID COUNTY, DESCRIBED AS FOLLOWS:

BEGINNING AT THE EASTERLY CORNER OF SAID LOT 36, DISTANT 103.43 FEET NORTHERLY FROM THE SOUTHWESTERLY CORNER OF SAID LOT 36; THENCE SOUTHERLY ALONG THE SOUTHWESTERLY CORNER OF SAID LOT, THENCE SOUTHWESTERLY ALONG THE SOUTHWESTERLY LINE OF SAID LOT, A DISTANCE OF 36.27 FEET; THENCE EASTERLY TO THE POINT OF BEGINNING, THENCE NORTHWESTERLY ALONG THE SOUTHWESTERLY LINE OF SAID LOT, A DISTANCE OF 103 FEET; THENCE NORTHEASTERLY IN A DIRECT LINE TO THE POINT OF BEGINNING.

PARCEL 2: PORTION OF APN: 7139-015-017

THAT PART OF LOT 36 OF TRACT NO. 4493, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 49, PAGE 28 OF THE PUBLIC RECORDS OF SAID COUNTY, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE EASTERLY LINE OF SAID LOT 36, DISTANT 103.43 FEET NORTH OF THE SOUTHWESTERLY CORNER OF SAID LOT 36; THENCE SOUTHWESTERLY ALONG THE SOUTHWESTERLY LINE OF SAID LOT 36 TO THE SOUTHWESTERLY CORNER OF SAID LOT 36; THENCE SOUTHWESTERLY ALONG THE SOUTHWESTERLY LINE OF SAID LOT 36, A DISTANCE OF 36.27 FEET; THENCE EASTERLY TO THE POINT OF BEGINNING.

STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 49, PAGE 28 OF THE PUBLIC RECORDS OF SAID COUNTY.

EXCEPT THE WEST FIVE FEET THEREOF.

ITEMS CORRESPONDING TO SCHEDULE "B":

- 1 1540 OVAL STREET, 500 FLOOR NEWPORT BEACH, CA 92660 DATED: AUGUST 3, 2020
- 2 1540 OVAL STREET, 500 FLOOR NEWPORT BEACH, CA 92660 DATED: AUGUST 3, 2020
- 3 1540 OVAL STREET, 500 FLOOR NEWPORT BEACH, CA 92660 DATED: AUGUST 3, 2020
- 4 209 SURVEY RELATED ITEMS WERE FOUND IN SCHEDULE "B" OF THE ABOVE MENTIONED PRELIMINARY REPORT. NON SURVEY RELATED ITEMS ARE SO STATED BELOW.
- 5 EASEMENT(S) FOR POLE LINES AND CONDUITS, RECORDED IN BOOK 3048, PAGE 292, OF OFFICIAL RECORDS. THIS ITEM IS BLANKET IN NATURE OVER THE ENTIRE PROJECT AREA RECORDED JULY 17, 1998 AS INSTRUMENT NO. 98-152702 AND JUNE 29, 2007 AS INSTRUMENT NO. 98-152702.
- 6 EASEMENT(S) FOR UTILITIES, RECORDED IN BOOK 6137, PAGE 28, OF OFFICIAL RECORDS. THIS ITEM IS BLANKET IN NATURE OVER THE ENTIRE PROJECT AREA RECORDED JULY 17, 1998 AS INSTRUMENT NO. 98-152702 AND JUNE 29, 2007 AS INSTRUMENT NO. 98-152702.
- 7 REDEVELOPMENT PROJECT AREA RECORDED JULY 17, 1998 AS INSTRUMENT NO. 98-152702 AND JUNE 29, 2007 AS INSTRUMENT NO. 98-152702.
- 8 SUBJECT PROPERTIES AND RESTRICTIONS RECORDED NOVEMBER 9, 2009 AS INSTRUMENT NO. 20091688309, OF OFFICIAL RECORDS. THIS ITEM IS BLANKET IN NATURE AND DOES AFFECT THE ENTIRE PROJECT AREA.
- 9 RECORDS OF THE CITY OF LONG BEACH IN NATURE AND DOES AFFECT THE ENTIRE PROJECT AREA.
- 10 RECORDS OF THE CITY OF LONG BEACH IN NATURE AND DOES AFFECT THE ENTIRE PROJECT AREA.
- 11 RECORDS OF THE CITY OF LONG BEACH IN NATURE AND DOES AFFECT THE ENTIRE PROJECT AREA.

PURSUANT TO SECTION 8815.5 OF THE CALIFORNIA PUBLIC RESOURCE CODE (CALIFORNIA PUBLIC RESOURCE CODE), A MAGNETIC DECLINATION WAS PROVIDED BY THE NATIONAL GEOPHYSICAL DATA CENTER AND WAS CALCULATED USING THE CURRENT WORLD MAGNETIC DECLINATION DATA CENTER WEBSITE: <http://www.ngdc.noaa.gov/geomag-web> (ELEVATION = 103.71)

LATITUDE = 33°49'46.205433"

LONGITUDE = -118°11'21.671923"

MAPPING ANGLE = -00°08'28.58"

COMBINED FACTOR = 1.00004982

RECORD REFERENCES:

- (R1) - INDICATES RECORD OR CALCULATED DATA PER TRACT NO. 4493, M.B. 49/28.
- (R2) - INDICATES RECORD OR CALCULATED DATA PER R.S.B. 217/097.
- (R3) - LONG BEACH RECORDS OR CALCULATED DATA CITY OF LONG BEACH THE BOOK L-71-38.

SURVEYOR'S NOTE:

THE DISTINCTIVE BOUNDARY SHOWN HEREON WAS DETERMINED BY A GROUND SURVEY PERFORMED IN SEPTEMBER, 2020 AND IS TO BE FILED AS PART OF THIS RECORD OF SURVEY WITH THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA.

SURVEYOR'S CERTIFICATE:

TO: THE CITY OF LONG BEACH AND TUTOR TITLE COMPANY

THIS IS TO CERTIFY THAT THIS MAP OR PLAN AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE SURVEYING STANDARDS ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 3, 4, 5 AND 6 OF TABLE A THEREOF.

SURVEY COMPLETED ON: SEPTEMBER 30, 2020

RECORD NO. 229

DATE: 10/12/2020

P.L.S. NO. 8862

SCALE: 1" = 20'

COORDINATES: 33°49'46.205433" LONGITUDE: -118°11'22.470594"

DRAWN BY: Barbara Adams		DESKED BY: AS-BUILT
DATE: 12/16/2022		NO. DATE
DESCRIPTION: PLANNING SUBMITTAL - R&P		APPROVAL
PROJECT NO.: 3005010108		SHEET # / REEF #
DRAWING NO.: 229		DATE: 10/12/2020

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP)
WET WEATHER EROSION CONTROL (WWECP) GENERAL NOTES**

- In case of emergency, call _____ at _____.
- A stand-by crew for emergency work shall be available at all times during the rainy season (October 1 to May 31) to respond to any emergency. Stand-by crew shall be available at convenient locations to facilitate rapid construction of emergency devices when rain is imminent.
- Erosion control devices shown on this plan may be removed when approved by the building official if the construction of emergency devices when rain is imminent.
- Grade areas adjacent to fill slopes located at the site perimeter must drain away from top of slope at the completion of each working day. All loose soils and debris that may create a potential hazard to off-site property shall be removed from the site within 24 hours of completion of each working day.
- All fill and debris shall be removed from all devices within 24 hours after each rainstorm and be disposed in a manner approved by the local authority having jurisdiction.
- A dewatering system shall be installed at the site whenever the depth of water in BMP devices exceeds the feet. The dewatering system shall be installed and operated within 24 hours after rainstorm. Pumping and draining of all basins and drainage devices must comply with the appropriate BMP for dewatering operations.
- The dewatering system shall be installed and operated within 24 hours after rainstorm. The system is set to the discretion of the field engineer. Additional devices as needed shall be installed to retain sediment and other pollutants on site.
- Excavation, trenching or other activities between November and April 15 of the following year without the approval of the Building Official.
- Storm Water Pollution Prevention and Erosion Control devices are to be modified, as the project progresses, the design and placement of these devices is the responsibility of the field engineer. Plans shall be submitted for approval by the Building Official.
- Every effort should be made to eliminate the discharge of non-storm water from the project sites at all times.
- Spillages of earth and other construction-related materials must be prevented from being transported from the site via street flow swales, area drainage, drainage courses, or wind.
- Spillages of earth and other construction-related materials must be prevented from being transported from the site via the forces of wind and water.
- Use of site materials, equipment, or vehicles must be stored in accordance with their listing and are not to contaminate the soils and surface waters. All approved storage containers are to be protected from rain. Containers must be covered with a tarp and cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.
- Excess or waste concrete may not be washed into the public way or any other drainage system.
- Developers/contractors are responsible to inspect all Erosion Control Devices and BMPs are installed and functioning properly. A copy of the inspection report shall be submitted to the Building Official after project completion and available for review by the Building Official when flooding occurs during the wet season. Inspections during rain events exceeding 0.1 inch over 24 hours period. In addition, susceptible slopes shall be covered. Copies of the self-inspection check list and inspection logs are available upon request.
- Construction of rainwater and disposal by wind.
- Sediment and other materials may not be tracked from the site by vehicle traffic. The construction of the project's construction activities on storm water quality. The project owner and contractor are responsible for the project's construction activities on storm water quality. The project owner and contractor are responsible for the project's construction activities on storm water quality. The project owner and contractor are responsible for the project's construction activities on storm water quality.
- Accidental discharges must be swept up immediately and may not be walked down by rain or other means. Accidental discharges must be swept up immediately and may not be walked down by rain or other means. Accidental discharges must be swept up immediately and may not be walked down by rain or other means.
- Any slopes with disturbed soils or denuded vegetation must be stabilized so as to inhibit by wind erosion.
- Any slopes with disturbed soils or denuded vegetation must be stabilized so as to inhibit by wind erosion.

20. The following notes must be on the plan (or submitted as a separate document - Prior to plan approval)
- As the Project Owner of authorized agent of the owner, I have read and understand the requirements to comply with these requirements and my representatives, contractor, developer, or engineer will make sure that all requirements are met. The following notes shall be included on the plan and kept at the construction site at all times and will be available for the review by the Building Official. The Building Official will be kept at the construction site at all times and will be available for the review by the Building Official. The Building Official will be kept at the construction site at all times and will be available for the review by the Building Official. The Building Official will be kept at the construction site at all times and will be available for the review by the Building Official.

NAME: _____ DATE: _____

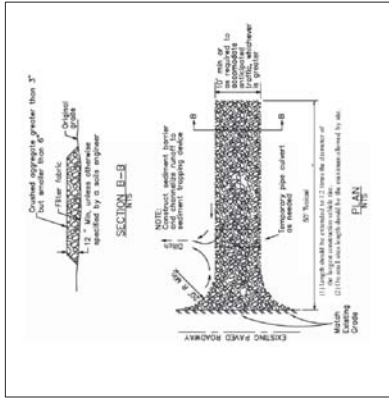
OWNER: _____

BEST MANAGEMENT PRACTICE SCHEDULE

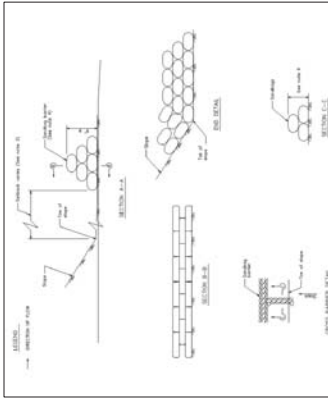
IN ACCORDANCE WITH CASSA - CALIFORNIA STORM WATER BMP HANDBOOK

LACDEW BMP MANUAL	CASSA BMP MANUAL	TITLE
SC-1	ESC-50	SILT FENCE
SC-2	ESC-56	SEDIMENT BASIN
SC-7	ESC-52	STREET SWEEPING AND VACUUMING
SC-10	ESC-24	STORM DRAIN INLET PROTECTION
TC-1	ESC-24	STABILIZED CONSTRUCTION ENTRANCE
NS-12	CA-10	CONCRETE FINISHING
WM-1	CA-10	MATERIAL DELIVERY AND STORAGE
WM-2	CA-10	SOIL STOCKPILE MANAGEMENT
WM-3	CA-12	SPALL PREVENTION AND CONTROL
WM-4	CA-20	SOLID WASTE MANAGEMENT
WM-5	CA-21	HAZARDOUS WASTE MANAGEMENT
WM-6	CA-23	CONCRETE WASTE MANAGEMENT
WM-8	CA-23	LIQUID WASTE MANAGEMENT
WM-10	ESC-6	LIQUID WASTE MANAGEMENT
WE-1	ESC-21	WIND EROSION CONTROL

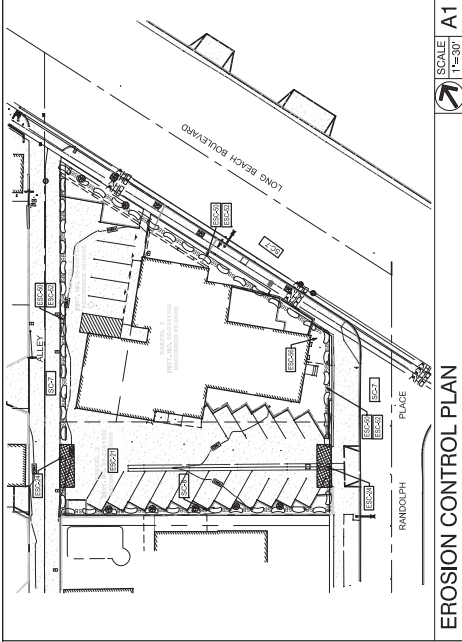
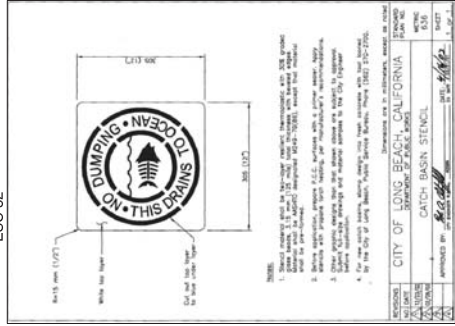
ASHBA
JOB #684
REGISTERED LANDSCAPE ARCHITECT
CALIFORNIA LICENSE #40533
15501 COLLEGE AVENUE, SUITE 200
SAN DIEGO, CA 92115



TC-1/ESC-24 CONSTRUCTION ENTRANCE



ESC-8 SANDBAG BARRIER



EROSION CONTROL PLAN

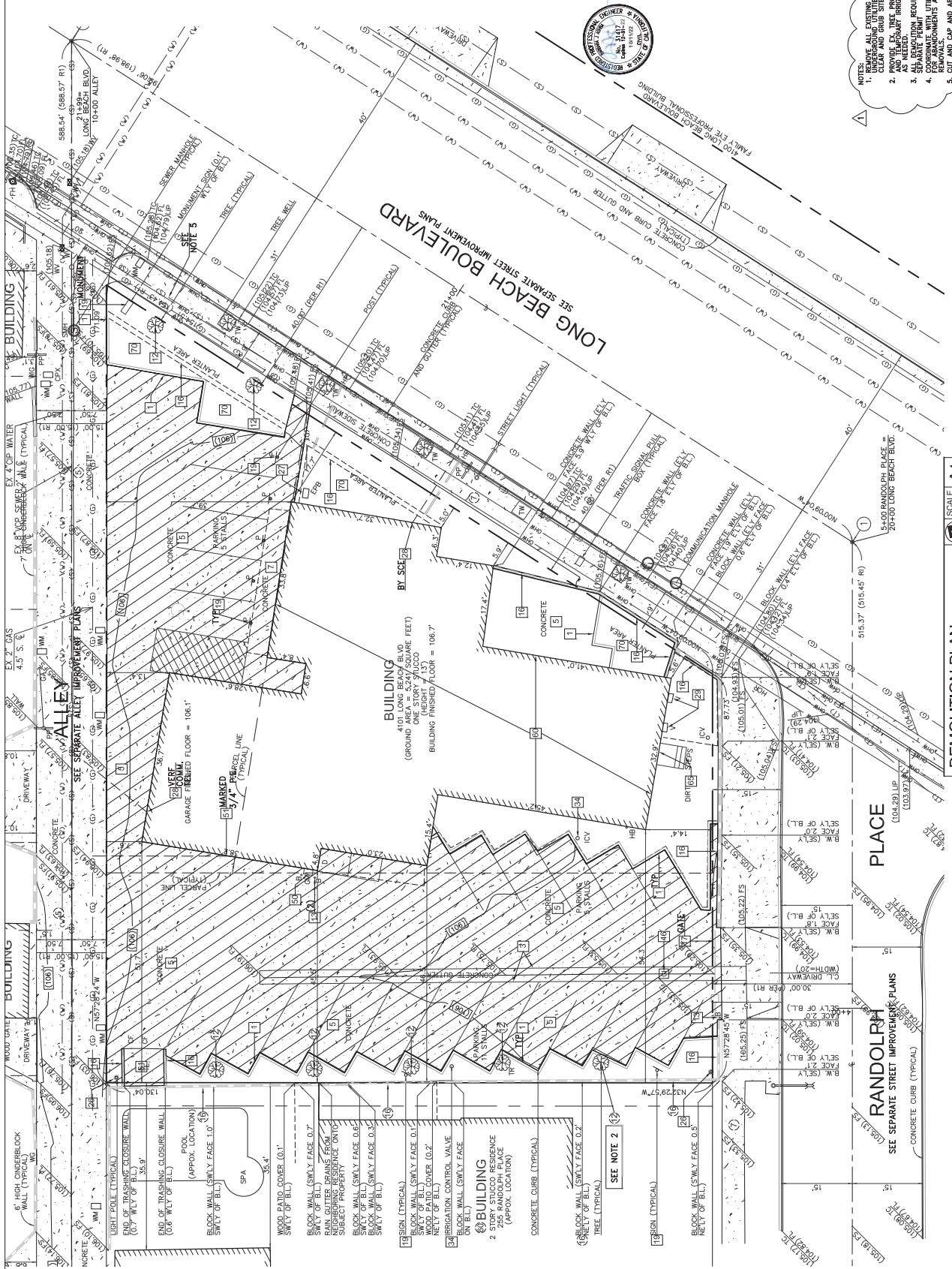
SCALE: 1"=30'

REGISTERED PROFESSIONAL ENGINEER
No. 51417
EXPIRES 12/31/2022

DESIGNED BY: Barbara Ashba
DRAWN BY: REF.
CHECKED BY: REF.
DESIGN CHECKED BY: REF.
DATE: 12/19/2021
PLAN CHECK SUBMITTAL - B&P
APPROVAL: REF.

FIRE STATION 9
4101 LONG BEACH BLVD, LONG BEACH, CA 90807
EROSION CONTROL PLAN AND STD BMPs

PROJECT NO.: 3005010108
SHEET # 18 OF 229
PHASE # / REVISION #
DIVISION NO.: C-69116



NO.	DATE	DESCRIPTION	APPROVAL
1	12/22/2022	PLAN CHECK SUBMITTAL - RSP	
2		DESIGN	
3		SHEET	
4		AS-BUILT	

DESIGNED BY:	Barbara Ashba
CHECKED BY:	Barbara Ashba
DATE:	12/22/2022
PROJECT NO.:	3005010108
PHASE #:	1 / SHEET 3
PROJECT NAME:	4101 LONG BEACH BLVD, LONG BEACH, CA 90807
PROJECT NO.:	19(C007) OF 229
PROJECT NAME:	C-99116

CONSTRUCTION SCHEDULE	REVISIONS
1. Remove existing building structure.	1. Add Note 1
2. Excavate and backfill.	2. Add Note 2
3. Install concrete foundation.	3. Add Note 3
4. Install concrete walls.	4. Add Note 4
5. Install concrete floor.	5. Add Note 5
6. Install concrete roof.	6. Add Note 6
7. Install concrete stairs.	7. Add Note 7
8. Install concrete foundation.	8. Add Note 8
9. Install concrete walls.	9. Add Note 9
10. Install concrete floor.	10. Add Note 10
11. Install concrete roof.	11. Add Note 11
12. Install concrete stairs.	12. Add Note 12
13. Install concrete foundation.	13. Add Note 13
14. Install concrete walls.	14. Add Note 14
15. Install concrete floor.	15. Add Note 15
16. Install concrete roof.	16. Add Note 16
17. Install concrete stairs.	17. Add Note 17
18. Install concrete foundation.	18. Add Note 18
19. Install concrete walls.	19. Add Note 19
20. Install concrete floor.	20. Add Note 20
21. Install concrete roof.	21. Add Note 21
22. Install concrete stairs.	22. Add Note 22
23. Install concrete foundation.	23. Add Note 23
24. Install concrete walls.	24. Add Note 24

NOTICE

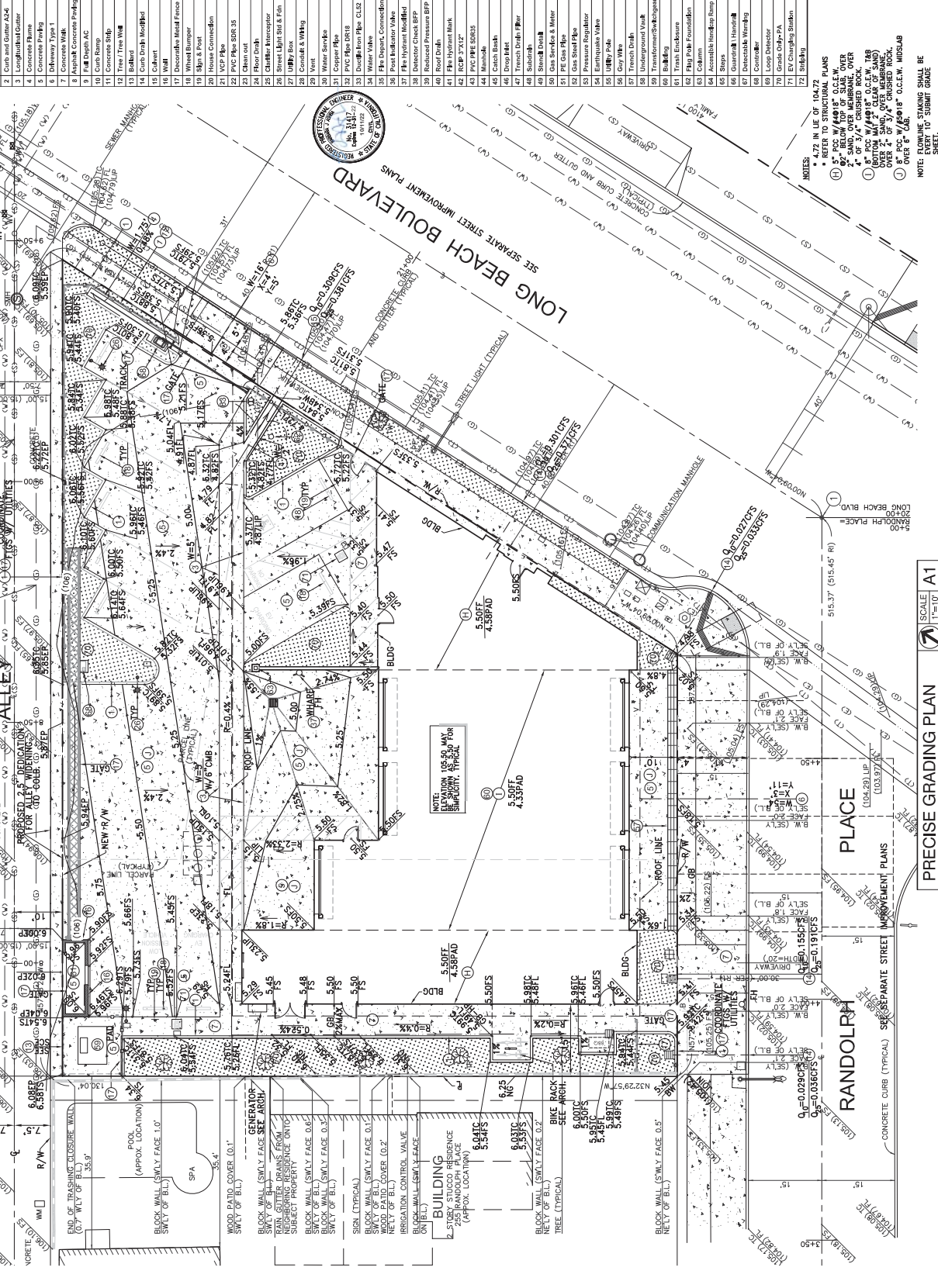
- REMOVE ALL EXISTING ON SITE UNDERGROUND UTILITIES.
- PROVIDE EX. TREE PROTECTION AND NEIGHBORLY IRRIGATION.
- ALL DEMOLITION REQUIRES A PERMIT FROM THE CITY OF LONG BEACH.
- COORDINATE WITH UTILITY CO. FOR ABANDONMENTS AND CUT AND CAP AND ABANDON CONSTRUCTION STREET MATERIAL.

ASHBA
 ENGINEERS
 10000 W. LONG BEACH BLVD.
 LONG BEACH, CA 90804
 (562) 436-0888
 WWW.ASHBAENGINEERS.COM



SCALE 1"=10'
 DEMOLITION PLAN

FILE INFO: E:\ashba\Working\008. GRADING PLAN - 8164.dwg
 ASHBA
 108A 86A
 PROJECT NO. 3005010108
 SHEET # 229
 20/C008 OF 229
 DWG. NO. C-9916



NO.	DATE	DESCRIPTION	APPROVAL
1	12/16/2021	DESIGN CHECK SUBMITTAL - R&P	
2	04/22/2022	PLAN CHECK RE-SUBMITTAL - R&P	

NO.	DATE	DESCRIPTION	APPROVAL
1	12/16/2021	DESIGN CHECK SUBMITTAL - R&P	
2	04/22/2022	PLAN CHECK RE-SUBMITTAL - R&P	

NO.	DATE	DESCRIPTION	APPROVAL
1	12/16/2021	DESIGN CHECK SUBMITTAL - R&P	
2	04/22/2022	PLAN CHECK RE-SUBMITTAL - R&P	

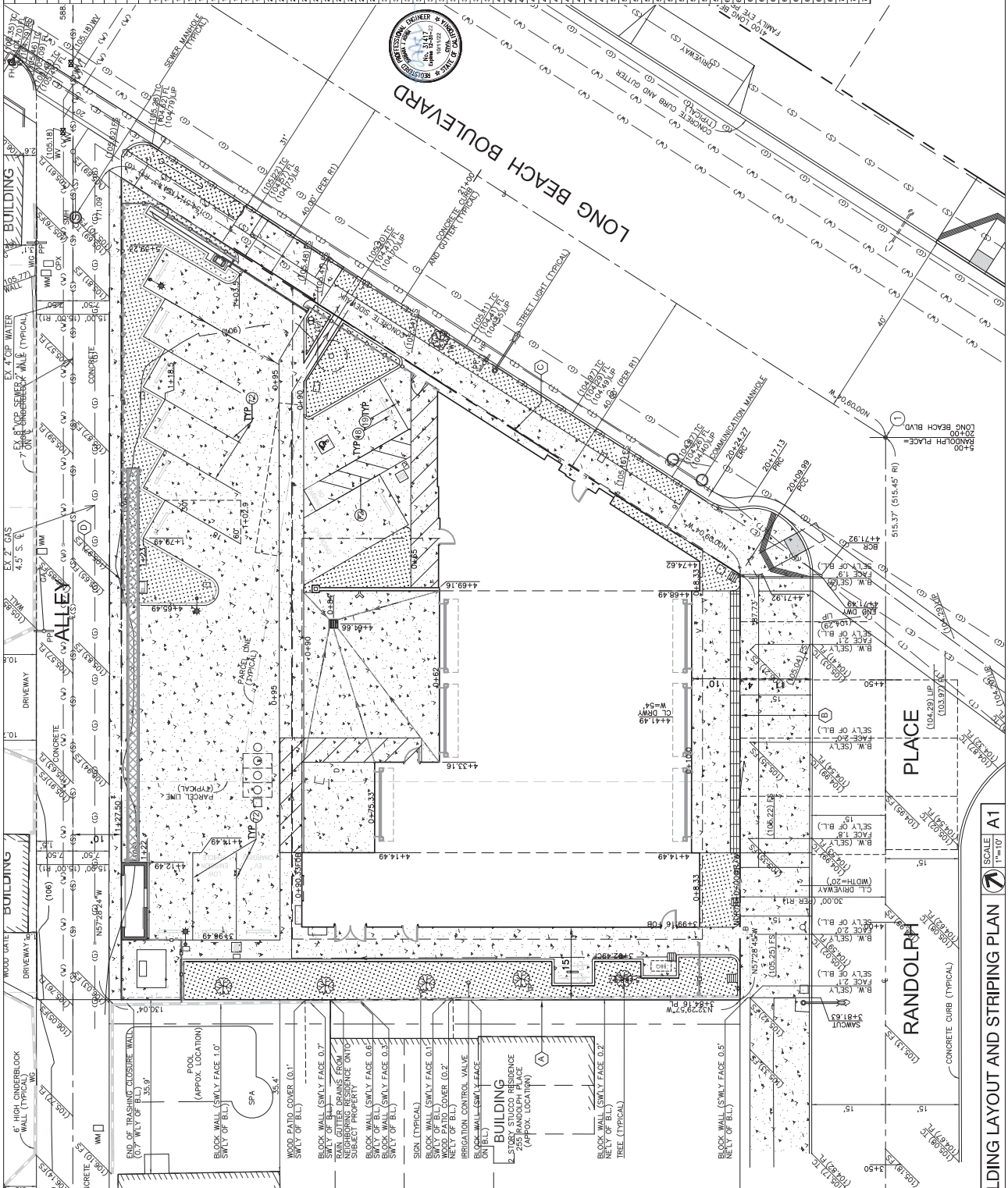
CONSTRUCTION SCHEDULE
 1. Excavation: 10/15/22
 2. Foundation: 10/20/22
 3. Concrete: 11/05/22
 4. Framing: 11/15/22
 5. Mechanical/Electrical: 12/01/22
 6. Drywall: 12/15/22
 7. Painting: 01/05/23
 8. Final Inspection: 01/20/23

NOTES:
 1. REFER TO STRUCTURAL PLANS
 2. REFER TO MECHANICAL/ELECTRICAL PLANS
 3. REFER TO CIVIL PLANS
 4. REFER TO LANDSCAPE ARCHITECTURE PLANS
 5. REFER TO SITEWORK PLANS
 6. REFER TO UTILITY PLANS
 7. REFER TO TRAFFIC PLANS
 8. REFER TO IRRIGATION PLANS
 9. REFER TO LIGHTING PLANS
 10. REFER TO SIGNAGE PLANS
 11. REFER TO FENCE PLANS
 12. REFER TO SECURITY PLANS
 13. REFER TO AV PLANS
 14. REFER TO DATA PLANS
 15. REFER TO SPECIALTY PLANS
 16. REFER TO ARCHITECTURAL PLANS
 17. REFER TO INTERIOR FINISHES PLANS
 18. REFER TO EXTERIOR FINISHES PLANS
 19. REFER TO PAINT SCHEDULE
 20. REFER TO MATERIAL SCHEDULE
 21. REFER TO EQUIPMENT SCHEDULE
 22. REFER TO CONSTRUCTION SCHEDULE
 23. REFER TO PERMITS
 24. REFER TO REGULATIONS
 25. REFER TO STANDARDS
 26. REFER TO SPECIFICATIONS
 27. REFER TO CONTRACT DOCUMENTS
 28. REFER TO LOCAL ORDINANCES
 29. REFER TO COUNTY ORDINANCES
 30. REFER TO STATE ORDINANCES
 31. REFER TO FEDERAL ORDINANCES
 32. REFER TO INTERNATIONAL BUILDING CODES
 33. REFER TO INTERNATIONAL FIRE CODES
 34. REFER TO INTERNATIONAL PLUMBING CODES
 35. REFER TO INTERNATIONAL MECHANICAL AND ELECTRICAL CODES
 36. REFER TO INTERNATIONAL ENERGY CODES
 37. REFER TO INTERNATIONAL SAFETY CODES
 38. REFER TO INTERNATIONAL ACCESSIBILITY STANDARDS
 39. REFER TO INTERNATIONAL ENVIRONMENTAL STANDARDS
 40. REFER TO INTERNATIONAL HEALTH AND SAFETY STANDARDS
 41. REFER TO INTERNATIONAL QUALITY STANDARDS
 42. REFER TO INTERNATIONAL BEST PRACTICES
 43. REFER TO INTERNATIONAL INNOVATIONS
 44. REFER TO INTERNATIONAL TRENDS
 45. REFER TO INTERNATIONAL RESEARCH
 46. REFER TO INTERNATIONAL EXPERIENCE
 47. REFER TO INTERNATIONAL KNOWLEDGE
 48. REFER TO INTERNATIONAL SKILLS
 49. REFER TO INTERNATIONAL ATTITUDES
 50. REFER TO INTERNATIONAL VALUES
 51. REFER TO INTERNATIONAL BELIEFS
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BUILDING LAYOUT AND STRIPING PLAN SCALE 1"=10'

- NOTES:**
- (A) N 32° 40' W ~ 127.50'
 - (B) N 57° 20' E ~ 87.78'
 - (C) SOUTH ~ 151.46'
 - (D) N 57° 20' E ~ 168.48'



NO.	DATE	SHEET	APPROVAL	DESCRIPTION
1	12/16/2021			PLAN CHECK SUBMITTAL - RSP
2	12/22/2022			PLAN CHECK SUBMITTAL - RSP

NO.	DESCRIPTION
1	CONTRACTOR'S REVIEW
2	CONTRACTOR'S REVIEW
3	CONTRACTOR'S REVIEW
4	CONTRACTOR'S REVIEW
5	CONTRACTOR'S REVIEW
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4101 LONG BEACH BLVD., LONG BEACH, CA 90801

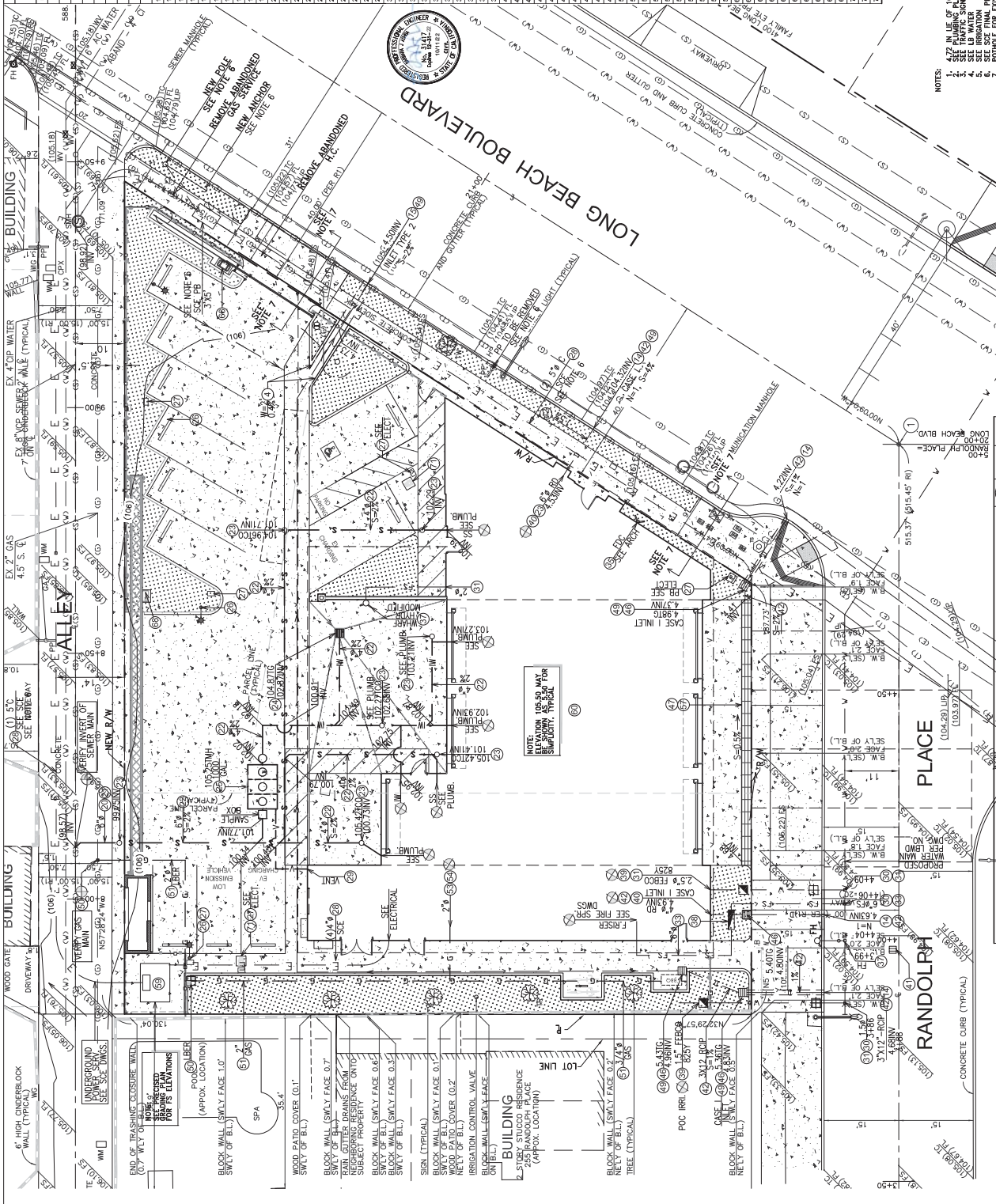
FIRE STATION 9

BUILDING LAYOUT AND STRIPING PLAN

PROJECT NO. 3005010108
 PHASE # / REVISION #
 SHEET # / TOTAL # 21 / C009 OF 229
 DWG. NO. C-6616



DESIGNED BY: Barbara Ashba
 DRAWN BY: REF.
 CHECKED BY: REF.
 APPROVAL: REF.



UTILITY PLAN
SCALE 1"=10'
A1

- NOTES:
1. 4.7' IN LIE OF 104.72
 2. SEE TRAFFIC SIGNAL PLANS
 3. SEE LB WATER MAIN
 4. SEE LB GAS MAIN
 5. SEE SEE FINAL PLANS
 6. SEE SEE FINAL PLANS
 7. UTILITIES AND EIGHTHS

NO.	DATE	DESCRIPTION	APPROVAL
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2	12/16/2022	PLAN CHECK RE-SUBMITTAL - R&P	

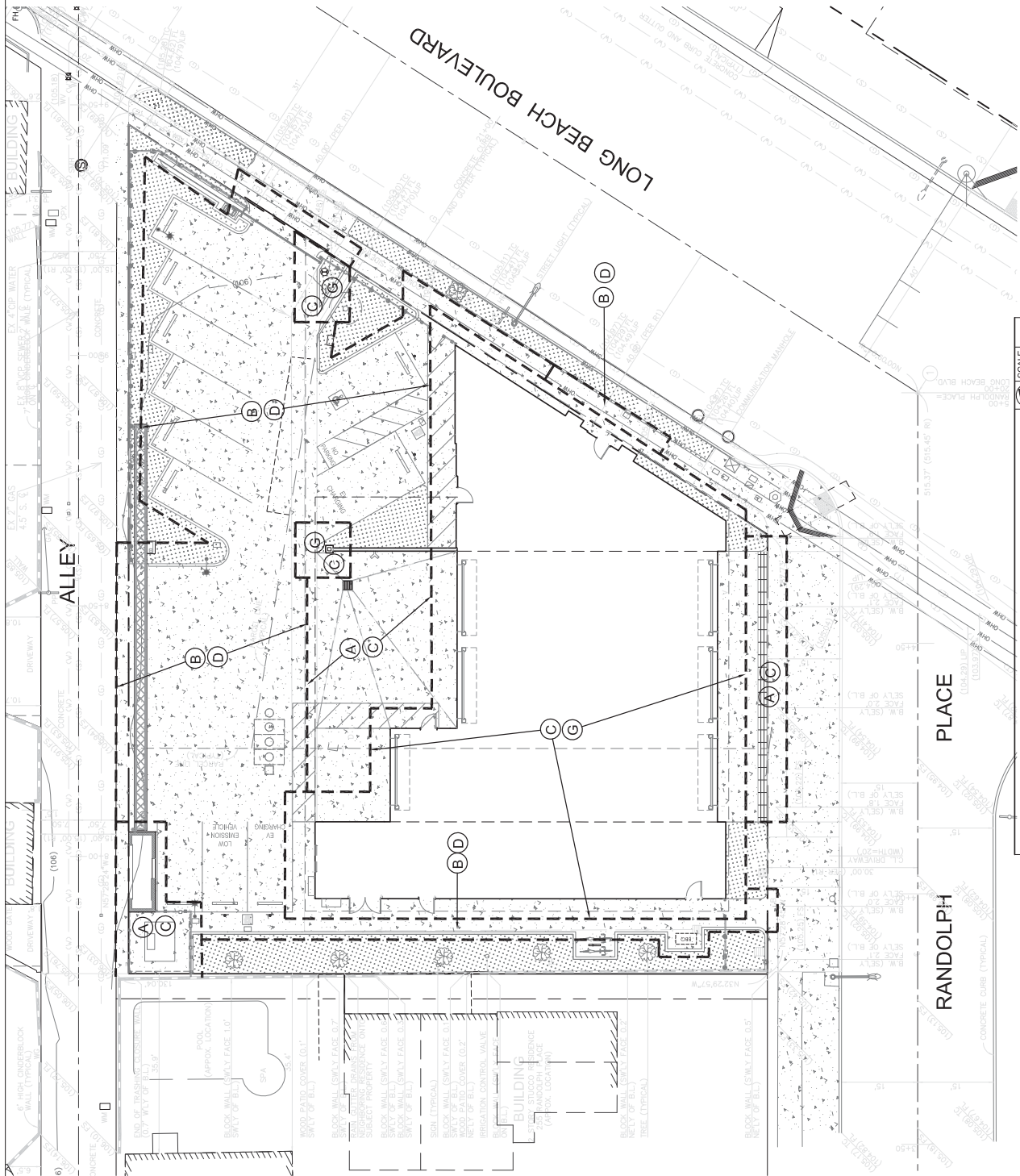
DESIGNER: Barbara Ahlha	DATE: 12/16/2021
DESIGN CHECKED BY: REF.	
PROJECT NO: 3005010108	
PHASE: # / REVISION #	
SHEET: 22/C010 OF 229	
DWG. NO.: C-96116	

CONSTRUCTION SCHEDULE	REVISIONS
1. Excavation	1. Excavation
2. Foundation	2. Foundation
3. Framing	3. Framing
4. Mechanical	4. Mechanical
5. Electrical	5. Electrical
6. Plumbing	6. Plumbing
7. Finishes	7. Finishes
8. Occupancy	8. Occupancy

UTILITY PLAN
FIRE STATION 9
4101 LONG BEACH BLVD, LONG BEACH, CA 90807



DESIGNER: Barbara Ahlha
DATE: 12/16/2021
DESIGN CHECKED BY: REF.
PROJECT NO: 3005010108
PHASE: # / REVISION #
SHEET: 22/C010 OF 229
DWG. NO.: C-96116



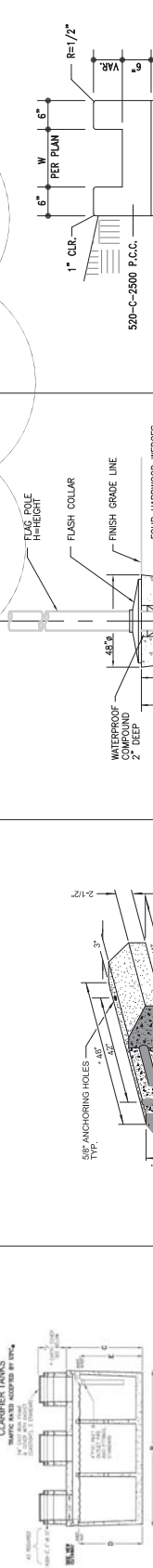
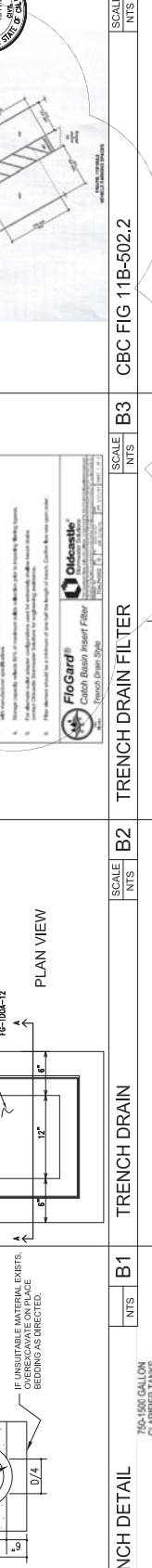
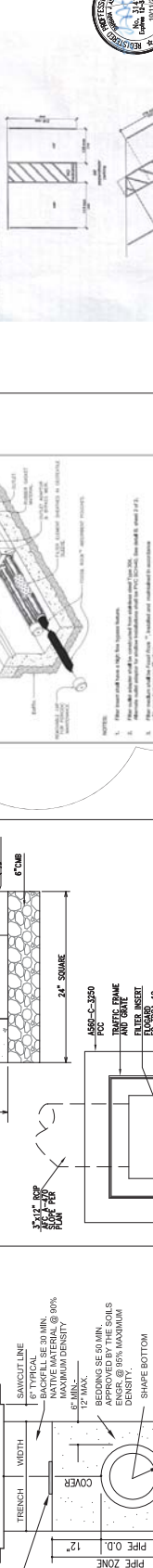
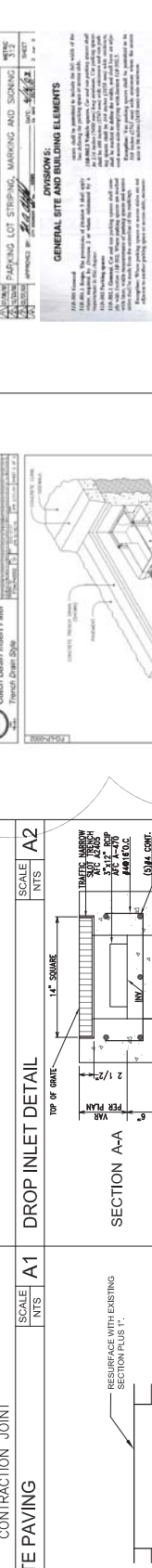
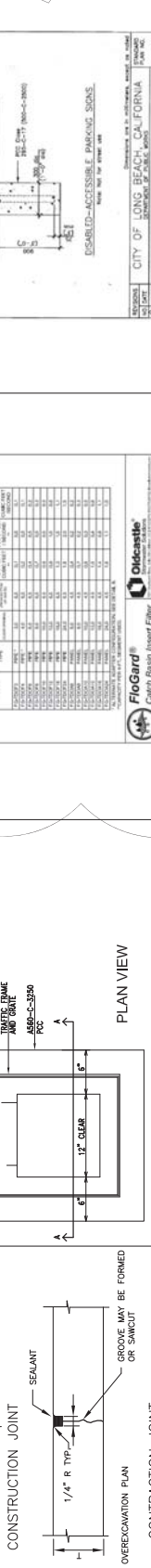
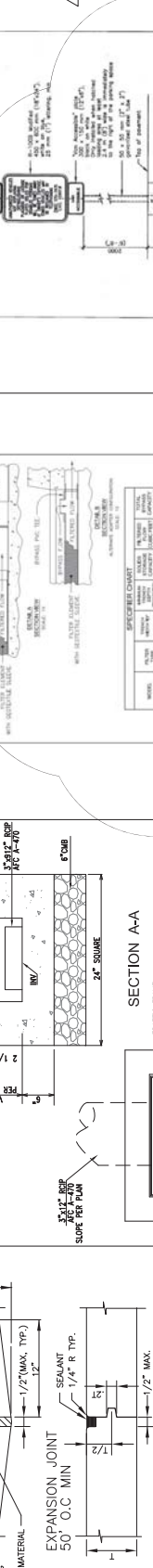
- NOTES: (GEOTECHNICAL RECOMMENDATIONS)
- MINOR GRADE TILES AND SLABS ON GRADE SHALL BE STRUCTURALLY SEPARATED FROM THE EXCAVATION. ALL TILES AND SLABS SHOULD EXTEND TO AT LEAST 2 FEET BELOW THE BOTTOM OF THE FOOTING OF ALL EXCAVATIONS AND SHALL BE SLABS-ON-GRADE.
 - EXCAVATION FOR PAVEMENTS AND EXCAVATION AT LEAST 1 FOOT AS MEASURED FROM THE BOTTOM OF THE EXCAVATION. EXCAVATION SHOULD EXTEND LATERALLY BEYOND THE FOUNDATION LIMITS BY THE DEPTH OF OVER-EXCAVATION, WHICHEVER IS GREATER.
 - EXCAVATION FOR OTHER IMPROVEMENTS (E.G., CONCRETE WALKWAYS, FLATWORK, STAIRS, ETC.) SHALL BE EXCAVATED AT LEAST 7 FEET BEYOND THE LIMITS OF THE IMPROVEMENTS.
 - PRIOR TO PLACEMENT OF FILL OR CONCRETE FOR FOUNDATIONS, THE BOTTOM SHOULD BE SCARIFIED TO A DEPTH OF AT LEAST 6 INCHES. SOILS SHOULD BE MOISTURE CONDITIONED TO ACHIEVE GENERALLY CONSISTENT MOISTURE ABOVE THE OPTIMUM MOISTURE CONTENT. THE SCARIFIED BOTTOM SHOULD BE RELATIVE TO THE LATEST VERSION OF ASTM WITH THE MOISTURE CONDITIONING EVALUATED AND APPROVED BY THE GEO-TECHNICAL ENGINEER.
 - COMPACTED FILL SHOULD BE PLACED IN LIFT THICKNESSES OF 8 TO 10 INCHES IN LOOSE THICKNESS. COMPACTED FILL SHOULD BE CONDITIONED, MIXED, AND THEN COMPACTED BY MECHANICAL METHODS. APPROXIMATELY 2 PERCENT ABOVE THE OPTIMUM MOISTURE CONTENT. FILL TO A MINIMUM RELATIVE COMPACTION OF 95 PERCENT WITHIN THE UPPER ONE FOOT OF ALL EXCAVATIONS AND 90 PERCENT IN ALL OTHER AREAS.
 - STRUCTURE FOUNDATIONS SHOULD ALL BE CONSTRUCTED ON NATIVE OR ALL ON EXPANSIVE ENGINEERED FILL OR ALL ON NATIVE SOILS, DEPENDING ON THE THICKNESS OF UNDOCUMENTED FILL ENCOUNTERED DURING CONSTRUCTION.



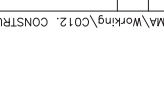
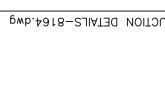
PROJECT NO. 3005010108
 PHASE # / REVISION #
 SHEET NO. 23/0011 OF 229
 DWG. NO. C-6616

DRAWN BY: Barbara Ashba
 CHECKED BY: REF.
 DESIGN CHECKED BY: REF.
 DATE: 12/16/2021
 PLAN CHECK SUBMITTAL - B&P
 DATE: 04/22/2022
 PLAN CHECK RE-SUBMITTAL - B&P

FIRE STATION 9
 OVER EXCAVATION PLAN
 4101 LONG BEACH BLVD., LONG BEACH, CA 90807



PROJECT NO. 3005010108
 SHEET 24/C012 OF 229
 PHASE # / REVISION #
 C-0616
 4101 LONG BEACH BLVD., LONG BEACH, CA 90807
 CONSTRUCTION DETAILS
 FIRE STATION 9
 DESIGNED BY: BARBARA ARIAS
 DRAWN BY: MEL
 CHECKED BY: MEL
 APPROVAL: [Signature]



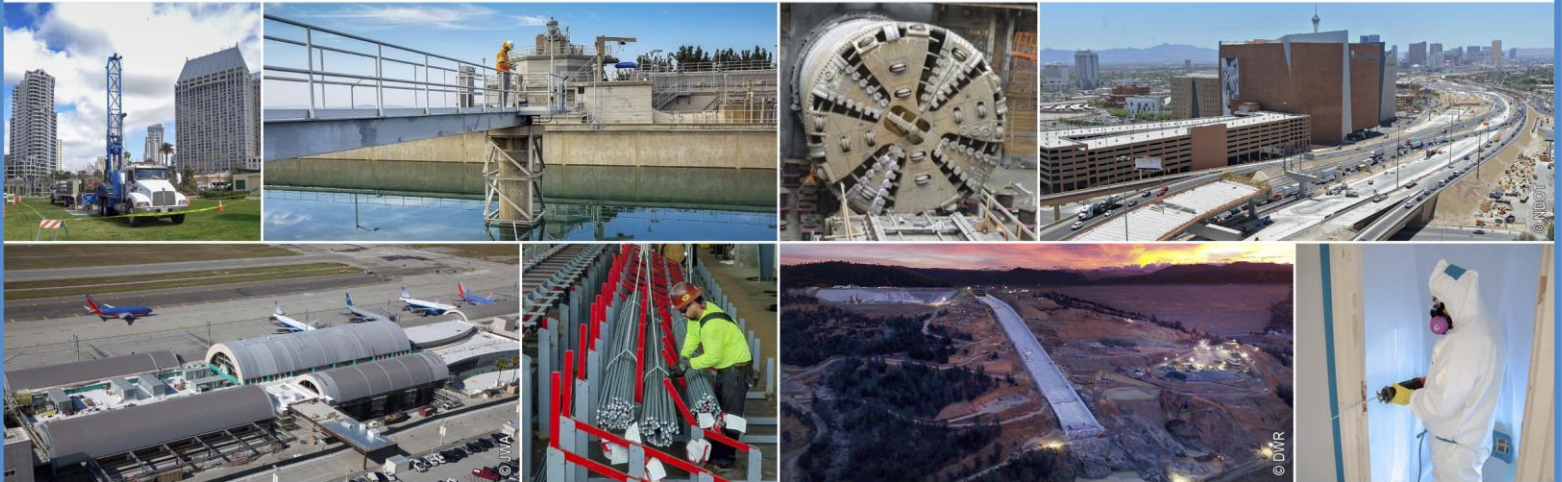
ASHBA
 CONSULTING ENGINEERS LIMITED
 4101 LONG BEACH BLVD., SUITE 200
 LONG BEACH, CA 90807
 TEL: (562) 433-8888
 FAX: (562) 433-8899

Hazardous Building Material Survey Fire Station 9 Facility Project 4101 Long Beach Boulevard Long Beach, California 90807

Prepared for: City of Long Beach - Department of Public Works
411 West Ocean Boulevard, 5th Floor | Long Beach, California 90802

Submitted to: KOA Corporation
2141 West Oranewood Avenue | Orange, California 92868

August 23, 2023 | Project No. 210042028



Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

**Hazardous Building Material Survey
Fire Station 9 Facility Project
4101 Long Beach Boulevard
Long Beach, California 90807**

Prepared for: City of Long Beach - Department of Public Works
411 West Ocean Boulevard, 5th Floor | Long Beach, California 90802

Submitted to: KOA Corporation

Mr. Derry Mac Mahon
Senior Project Manager
2141 West Oranewood Avenue | Orange, California 92868

August 23, 2023 | Project No. 210042028

A handwritten signature in blue ink, appearing to read "Lucas Waide".

Lucas G. Waide
Staff Environmental Scientist
Asbestos Building Inspector

A handwritten signature in blue ink, appearing to read "Edilberto Quintero".

Edilberto Quintero
Senior Staff Environmental Scientist
Lead Sampling Technician #0274

A handwritten signature in blue ink, appearing to read "David M. Kelly".

David M. Kelly, CAC, CRIE, LRC
Senior Project Environmental Scientist
Certified Asbestos Consultant #23-7217

A handwritten signature in blue ink, appearing to read "Stephen J. Waide".

Stephen J. Waide, CIH, CSP, CIEC, CMC
Principal Environmental Scientist

LGW/EQ/DMK/SJW/mlc

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1 INTRODUCTION

In accordance with the Long Beach Department of Public Works authorization, Ninyo & Moore has performed a hazardous building material survey in support of upcoming demolition activities of the building located at 4101 Long Beach Boulevard in Long Beach, California (the site; Figure 1). This report has been prepared in accordance with generally accepted environmental science and engineering practices. This report is based on conditions at the site at the time of the sampling activities and provides documentation of our findings and recommendations.

2 PURPOSE AND SCOPE OF SERVICES

The objective of the survey is to provide information about current conditions within the site building regarding the potential presence of asbestos-containing materials (ACM), lead-containing surfaces (LCS), and other hazardous materials within the building which will require removal prior to the planned demolition activities. For the purposes of this assessment, LCS refers to lead-based paint (LBP), as defined by the California Department of Public Health (CDPH) and United States Department of Housing and Urban Development (HUD). The additional limited microbial evaluation was performed in order to determine moisture conditions of selected building materials, and to evaluate the extent of water intrusion and possible mold growth within the building.

The scope of services we performed is summarized below:

- Performed a visual reconnaissance of the building to evaluate the possible presence of ACM and LCS.
- Evaluated building materials for moisture content with a Delmhorst BD-2100 Moisture Meter and photo-documented water damaged areas within the building.
- Collected 65 bulk samples and submitted these samples to an independent laboratory for analysis of asbestos content. Samples were analyzed in accordance with the United States Environmental Protection Agency (EPA) recommended method of Polarized Light Microscopy (PLM) in accordance with EPA Test Method 600/R-93/116 July 93.
- Assessed suspect lead-containing building components by collecting 115 X-Ray fluorescence (XRF) readings (including calibrations) of potential LCS.
- Collected 2 interior and 2 exterior samples for airborne spores and submitted these samples to an independent laboratory for analysis of fungal spores by Optical Microscopy.
- Performed a visual assessment and quantification of miscellaneous hazardous materials including, but not limited to, fluorescent light bulbs (possible mercury); fluorescent light ballasts (possible polychlorinated biphenyls-containing oils); high intensity light bulbs (possible mercury); thermostat switches (possible liquid mercury and/or batteries); emergency lighting and exit signs (possible lead acid or other metal containing batteries or tritium); heating, ventilation, and air conditioning (HVAC) and refrigeration systems (possible chlorofluorocarbon [CFC] gas); and other possible hazardous materials.
- Prepared a field drawing showing suspect ACM and positive XRF sampling locations.

- Prepared this report, which presents our data and summarizes field activities, evaluated materials, and locations. This report includes a field drawn sample location map, a general area building description, laboratory testing information, laboratory test results, and conclusions and recommendations.

3 SITE BUILDING DESCRIPTION

4101 Long Beach Boulevard is a single-story slab on grade building that comprises an approximate 5,200 square foot area. The building includes offices, lobbies, an electrical room, restrooms, a storage room, a meeting room, a kitchen, a server room, and a garage. The interior walls are primarily finished with drywall and some areas are finished with plaster. The ceilings are primarily finished with laid-in ceiling tiles and some areas are finished with drywall. The flooring is primarily finished with carpeting and some areas are finished with vinyl floor tile or ceramic tile. The exterior walls are primarily finished with stucco and some areas are finished with stone, mortar and stucco. The roofing system is finished with rolled-on asphalt.

4 FIELD LIMITATIONS

Survey activities were limited to the aboveground building of the subject site within our scope. Underground utilities, such as suspect cementitious water lines or suspect insulated/coated gas or electrical lines, were not assessed during survey activities.

Physical limitations, such as inaccessible rooms or spaces, were generally not encountered during the survey activities. Since non-destructive sampling techniques were used, there is a possibility that additional suspect materials and/or surfaces may be encountered in inaccessible areas (e.g., interstitial wall and ceiling spaces and canopy soffits) during building renovation and/or demolition activities. For instance, untested thermal system insulation may be present within wall and ceiling cavities and/or behind plumbing and heating fixtures (e.g., sinks, boilers, and radiators). Suspect materials and/or surfaces encountered during building renovation and/or demolition activities that have not been assessed either may be assumed to be asbestos- and/or lead-containing and handled accordingly, or may be sampled and analyzed to assess whether they are asbestos- and/or lead-containing.

5 ASBESTOS SURVEY

The asbestos survey was performed on July 28, 2023, by Mr. Edilberto Quintero and Mr. Lucas Waide, who are both EPA Asbestos Building Inspectors and Mr. David Kelly, a Department of Occupational Safety and Health (DOSH) Certified Asbestos Consultant (CAC, #23-7217). The survey was performed under the supervision of Mr. Kelly, CAC (#23-7217). Consultant certificates are presented in Appendix A.

5.1 Asbestos Inspection, Sampling, and Quantification

The survey inspection and sampling procedures were performed in accordance with the guidelines published by the EPA in 40 Code of Federal Regulations (CFR) Part 763 Subpart E, October 30, 1987 (Asbestos Hazard Emergency Response Act [AHERA]); the EPA guidance document “Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials (EPA 560/5-85-030a, October 1985); the National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR Part 61, subpart M); and the South Coast Air Quality Management District (SCAQMD) Rule 1403.

The survey consisted of three parts including: visual inspection, sampling, and quantification of the building materials.

5.1.1 Visual Inspection

Initial observations were made throughout the structure to evaluate the presence and condition of accessible suspect materials. Materials which were similar in general appearance were grouped into homogeneous sampling areas (areas in which the materials are uniform in color, texture, construction, or application date), as recommended by the EPA. Each homogeneous area was observed for material type, location, condition, and friability.

The definition of friability is any material containing more than one percent asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. The EPA’s NESHAP regulation has different material categories for ACMs. These categories are used when demolition or renovation projects are being conducted. Each identified suspect homogeneous material was placed in one of the following EPA categories:

- **Category I Non-friable** - NESHAP defines a Category I non-friable ACM as packing, gaskets, resilient floor covering (except sheet flooring products which are considered friable), and asphalt roofing products which contain more than one percent asbestos.
- **Category II Non-friable** - NESHAP defines a Category II non-friable ACM as any material, except for Category I non-friable ACM, which contains more than one percent asbestos and cannot be reduced to a powder by hand pressure when dry.
- **Regulated Asbestos Containing Material** - is (a) friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

In accordance with the EPA and AHERA, suspect materials were also placed in one of three classifications:

- **Surfacing Materials** - materials generally applied via sprayed or trowel methods,

- **Thermal Systems Insulation (TSI)** - materials generally applied to various mechanical systems, or
- **Miscellaneous Materials** - any materials which do not fit in the Surfacing or TSI classifications.

It should be noted that SCAQMD Rule 1403 is more stringent than NESHAP and since this site is within SCAQMD jurisdiction, all Rule 1403 requirements were followed. The SCAQMD Rule 1403 requirements for asbestos emissions from demolition/renovation activities requires a facility survey. The affected facility or facility components must be thoroughly surveyed for the presence of asbestos prior to any demolition or renovation activity. The survey must include the inspection, identification, and quantification of all friable, and Class I and Class II nonfriable ACM, and any physical sampling of materials. SCAQMD definitions for asbestos are as follows:

- **ACM** - is both friable asbestos-containing material or Class I nonfriable asbestos-containing material.
- **Asbestos-containing waste material (ACWM)** - is any waste that contains commercial asbestos and that is generated by a source subject to the provisions of this rule. ACWM includes, but is not limited to, ACM which is friable, has become friable, or has a high probability of becoming friable, or has been subjected to sanding, grinding, cutting, or abrading, and the waste generated from its disturbance, such as asbestos waste from control devices, particulate asbestos material, asbestos slurries, bags or containers that previously contained asbestos, used asbestos-contaminated plastic sheeting and clothing, and clean-up equipment waste, such as cloth rags or mop heads.
- **Class I nonfriable asbestos-containing material** - is material containing more than one percent (1%) asbestos, and that, when dry, can be broken, crumbled, pulverized, or reduced to powder in the course of demolition or renovation activities. Actions which may cause material to be broken, crumbled, pulverized, or reduced to powder include physical wear and disturbance by mechanical force, such as, but not limited to, sanding, sandblasting, cutting or abrading, improper handling or removal or leaching of matrix binders. Class I nonfriable asbestos-containing material includes, but is not limited to, fractured or crushed asbestos cement products, transite materials, mastic, roofing felts, roofing tiles, cement water pipes and resilient floor covering.
- **Class II nonfriable asbestos-containing material** - is all other material containing more than one percent (1%) asbestos, that is neither friable nor Class I nonfriable.
- **Friable asbestos-containing material** - is material containing more than one percent (1%) asbestos, and that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

If asbestos is identified in a sample from a homogeneous area, the entire homogeneous area is considered to contain asbestos. Representative samples were collected from each homogeneous area within the scope of work. While some well-hidden suspect ACM may have escaped evaluation, all layers of suspect building material (to joist- or frame-level) as well as materials above plenums, inside soffits, or other concealed spaces have been evaluated.

5.1.2 Sampling Procedures

Following an initial walkthrough, the inspector collected selected samples of accessible materials identified as suspect ACM. EPA, AHERA, NESHAP, and SCAQMD guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous material. Samples of surfacing material were collected in general accordance with the EPA sampling protocol outlined in EPA 560/5-85-030a, October 1985. Representative samples were collected from already damaged areas or areas which were the least visible. Samples of miscellaneous materials were collected as randomly as possible, while attempting to sample already damaged areas so as to minimize disturbance of the material. Generally, one to three samples of each homogeneous material were collected of miscellaneous materials and TSI, if present.

5.1.3 Quantification

Quantities of accessible and/or exposed building materials that were suspected of containing asbestos were estimated by taking approximate measurements in the field. Quantities are presented in SF or linear feet to be used as a guide for contractor estimates on bidding for abatement activities. It is the abatement contractor's responsibility to confirm quantities prior to bidding and removal.

5.2 Asbestos Laboratory Analysis Procedures

Analysis was performed by Eurofins EPK Built Environment Testing (Eurofins), located at 2841 Dow Avenue, Suite 300 in Tustin, California (phone number 866-888-6653). Eurofins is a National Volunteer Laboratory Accreditation Program (NVLAP) accredited laboratory (NVLAP No. 200757-0). A chain-of-custody, documenting the possession of the samples from the time they were collected until analyzed and stored, was submitted with the bulk samples. The original chain-of-custody accompanied the materials at all times. Custody documentation began at the time samples were collected and each transferor retained a copy of the chain-of-custody record.

Analysis was performed by using the bulk sample for visual observation and slide preparation(s) for microscopic examination and identification. The samples were mounted on slides and then analyzed for asbestos (chrysotile, amosite, crocidolite, anthophyllite, and actinolite/tremolite), fibrous non-asbestos constituents (mineral wool, paper, etc.), and non-fibrous constituents. Refractive indices, morphology, color, pleochroism, birefringence, extinction characteristics, and signs of elongation identified asbestos. The same characteristics were used to identify the non-asbestos constituents.

The microscopist visually estimated relative amounts of each constituent by determining the volume of each constituent in proportion to the total volume of the sample, using a stereoscope. The bulk samples were analyzed by PLM with dispersion staining as described by the method of the determination of asbestos in bulk insulation, EPA/600/R-93/116, July 1993. This is a standard method of analysis in optical mineralogy and the currently accepted method for the determination of asbestos in bulk samples. A suspect material is immersed in a solution of known refractive index and subjected to illumination by polarized light. The characteristic color displays which result enable mineral identification.

6 LCS SURVEY

The LCS survey was performed on July 28, 2023, by Mr. Edilberto Quintero, a CDPH Lead-Related Construction (LRC) Sampling Technician (#0274). Work was performed under the supervision of Mr. David Kelly, a CDPH LRC Sampling Technician (#2395) and Mr. William Larkin, a CDPH LRC Inspector/Assessor (#1285). Consultant certificates are presented in Appendix A.

The survey was conducted using a portable Sci-Aps 550 XRF analyzer in accordance with accepted environmental science and engineering practices. The protocol used for selecting components and sampling locations was that contained in the federal HUD “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing” (Chapter 7 “Lead-Based Paint Inspection”), except the inspection was limited to accessible materials and, once a pattern was recognized for the component results, fewer readings for each component were collected.

The XRF analyzer used for the testing is a direct-reading instrument that determines the concentration of lead in painted surfaces by subjecting the surfaces to energy from a small radioactive source. When the instrument is placed against a surface, the energy from the XRF causes the surface to emit X-Rays that are indicative of the chemical make-up of the surface coating(s), which the XRF then analyzes. The instrument was calibrated to the manufacturer’s specifications and the calibration was checked, at least every four hours and at the beginning and completion of each set of readings, against known lead sample standards produced by the National Institute of Standards and Testing. The XRF instrument measures lead in units of milligrams per square centimeter (mg/cm^2). A total of 115 XRF readings were collected (including calibration checks) over the course of the survey activities.

The CDPH requires that, after a lead evaluation is performed, a copy of CDPH form 8552 “Lead Hazard Evaluation Report” should be submitted. Ninyo & Moore has faxed this form to the CDPH and a copy is included in Appendix B.

7 MICROBIAL EVALUATION

The microbial evaluations were performed on August 4, 2023 by an Industrial Hygienist under the supervision of Mr. Stephen Waide, a Certified Industrial Hygienist. The evaluations included a visual assessment, the collection of moisture measurements, air sampling and photographic documentation of water-damaged areas. Consultant certificates are presented in Appendix A.

7.1 Visual Assessment and Air Testing Methodology

The visual assessments were performed throughout the interior locations. Visible water staining was documented, photographed, and noted on a field drawing. Air samples were collected from the general areas with visible water staining using Zefon™ Air-O-Cell sampling cassettes and a high-volume, rotating vane Gast™ sampling pump (calibrated to 15 liters of air per minute). The Air-O-Cell sampler is a particulate sampling cassette designed for the rapid collection and analysis of a wide range of airborne aerosols, including mold spores (to the genus level). This sampling device is useful in providing rapid analysis of airborne contaminants in indoor air quality testing.

Samplers were calibrated on site immediately before use and samples drawn for a period of five minutes each. Two samples were collected within the affected areas and two samples were collected outside of the building. Each collected air sample was labeled with a unique identification number corresponding to the sample location. Collected samples were documented on a chain-of-custody form and submitted to the laboratory for analysis. Samples were submitted to LA Testing (LA Testing), located at 5431 Industrial Drive in Huntington Beach, California. LA Testing is an American Industrial Hygiene Association Environmental Microbiology Accredited Laboratory.

8 INVENTORY OF UNIVERSAL WASTES

A visual evaluation of the building was performed on July 28, 2023, by Mr. Lucas Waide in order to quantify miscellaneous hazardous building materials. This included, but was not limited to, potential mercury-containing thermostats, switches, and fluorescent light tubes; items potentially containing PCBs; potential tritium or battery-containing exit signs; and potential CFC-containing refrigeration systems within HVAC units. These wastes were documented in order to identify their presence and location as they are required to be removed from the building prior to demolition activities.

9 SURVEY RESULTS

The following sections describe the survey and inventory results.

9.1 Asbestos Survey

A total of 65 samples of suspect ACM were collected and transferred under chain of custody procedures to Eurofins for analysis. The lower limit of reliable detection for asbestos using the PLM method is approximately 1 percent by volume. In the state of California, DOSH regulations define asbestos containing construction materials (ACCM) if one sample from a homogeneous area contains asbestos content of greater than one tenth of 1 percent (>0.1 percent) which is confirmed by PLM point count analysis (PLM 400- or 1000-point count analysis). Materials in which no asbestos was detected are defined in the laboratory report as “None detected.” Inaccessible suspect ACM that are suspect of being ACM are noted to be assumed asbestos-containing.

9.2 Asbestos Results Summary

Based on observations and the analytical results of bulk samples collected during the survey, assumed ACM were detected within the building at the site. The building materials which were assumed to be ACM are summarized in Table 1. The building materials which were sampled and found to be *non-asbestos* containing are summarized in Table 2. A copy of the laboratory analytical report and chain-of-custody records are presented in Appendix C. General photographic documentation of the structure and areas sampled is presented in Appendix D. The sample locations are shown on the field drawing presented in Appendix E.

Table 1 – Positive Asbestos Survey Results

Sample No. from COC	HA No.	Material	Location	Friable	Condition	Approximate Quantity/ Asbestos Content	Photograph No.
N/A	N/A	Mirror mastic	Restrooms mirrors	No	Intact	10 SF Assumed	5

Notes:

COC – chain of custody
 HA – homogeneous
 N/A – not applicable
 No. – number
 SF – square feet

I, Mr. David Kelly, (CAC #23-7217) assume the mirror mastics associated with the mirrors within the restrooms for the building at the site presented in Table 1 are ACM and is subject to SCAQMD Rule 1403.

Please note that the quantities of ACM are approximate. It is the abatement contractor’s responsibility to confirm quantities prior to bidding and demolition activities.

Table 2 – Non-Asbestos Containing Materials Sampled

Sample No. from COC	HA No.	Sample Material Descriptions	Material Location
01 – 03	1	Parapet wall	Roof
04 – 06	2	Roof core (Asphalt & foam)	Roof

Table 2 – Non-Asbestos Containing Materials Sampled

Sample No. from COC	HA No.	Sample Material Descriptions	Material Location
07 – 09	3	Flashing mastic	Roof
10 – 12	4	Penetration mastic	Roof
13 – 15	5	Ducting mastic	Roof
16 – 18	6	Stone mortar	Exterior walls
19 – 21	7	Caulking	Exterior door frames and windows
22 – 24	8	Stucco	Exterior walls
25 – 27	9	Concrete	Parking lot, side walk, and foundation
28 – 30	10	Plaster	Garage walls
31 – 33	11	Caulking	Restroom toilets and sinks
34 – 36	12	Cove base with mastic	Throughout walls
37 – 39	13	12"x12" Blue VFT with mastic	Kitchen and restrooms 1 & 2 floors
40 – 44	14	2'x4' Laid-in ceiling tile	Throughout ceilings
45 – 47	15	Tan ceramic floor tile with grout and thin-set	Lobby 2 & meeting room floors
48 – 50	16	Blue ceramic floor tile with grout and thin-set	Restroom 1 shower and countertop
51 – 53	17	White under-sink coating	Offices 5 & 6 sinks
54 – 60	18	Drywall w/ joint compound	Throughout walls and ceilings
61 – 65	19	Carpet glue	Throughout floors

Notes:

COC – chain of custody

HA – homogeneous

No. – number

VFT – vinyl floor tile

W/ – with

& – and

" – inches

' – feet

9.3 Lead-Containing Surfaces Summary

Federal efforts to regulate LBP began with the LBP Poison Prevention Act in 1971. In 1973, the Consumer Product Safety Commission (CPSC) defined LBP as paint having lead content equal to or greater than 0.5 percent by weight (1.0 mg/cm² by XRF) in a dry film of newly applied paint. In 1978, the CPSC lowered the allowable lead levels in new paint to 0.06 percent which is considered lead-containing paint. HUD developed guidelines relating to HUD facilities that specified lead content of 0.5 percent as an action level in determining the need for corrective action. However, a more stringent level is established by Los Angeles County Department of Health Services which defines “dangerous levels of lead-bearing substances” as paint or other surface coating with lead greater than 0.7 mg/cm² (Los Angeles County Code, Title 11, Chapter 11.28, Section 11.28.010 C). Federal and State DOSH do not define the amount of lead in paint to a regulatory requirement, rather the activities, or task, define when the regulation is in effect. Both Federal and State standards use the term “trigger task” activities. In the work place, employers must make certain assumptions of the exposure levels and comply with regulations based on the level of disturbance rather than the lead level.

A total of 115 XRF readings were collected from the representative testing combinations (e.g., unique combination of room equivalent, building component, substrate, and color) within the site building for the planned demolition. LBP was detected within building components with lead

content greater than 0.7 mg/cm² and their estimated quantities are presented in Table 3. In addition, some building components were reported to have detectable amounts of lead and are subject to DOSH Lead in Construction Standard, Title 8 California Code of Regulations (CCR) 1532.1. General photographic documentation of the LBP components is presented in Appendix D. The positive LBP XRF sample locations are shown on the field drawing presented in Appendix E. A summary of all XRF readings (including the building components with the detectable amounts of lead) is presented within Appendix F.

Table 3 – Lead Results Summary

Room/Area	Component	Substrate	Condition	Color	Result (mg/cm ²)	Approximate Quantity	Photograph No.
Exterior – parking lot	Floor	Concrete	Intact	White	1.3	50 LF	6
Restroom 1	Shower tile	Ceramic	Intact	Blue	7.5	100 SF	7
Restroom 1	Counter	Ceramic	Intact	Blue	7.5	25 SF	8

Notes
 EA – each
 LF – linear feet
 mg/cm² – milligram per square centimeter
 No. – number
 SF – square feet

Please note that the quantities of LBP are approximate. It is the abatement contractor’s responsibility to confirm quantities prior to bidding and demolition activities.

9.4 Microbial Evaluation Summary

During the field reconnaissance, the laid-in ceiling tiles within the building were observed to have been affected by water intrusion events. The interior areas with visible water staining were dry when measured with a Delmhorst® BD-2100 moisture meter. The source of the water intrusion appears to be from the roof. No visible mold was observed during our site visit. A summary of the visual evaluation, water staining and mold growth is presented in Table 4. Representative photographs are presented in Appendix C. Areas with visible water staining are shown on the field drawing presented in Appendix D.

Table 4 – Microbial Visual Assessment Summary

Area	Findings
Storage room	Ceiling - Visible water staining, no visible mold growth observed.
Lobby 1	Ceiling - Visible water staining, no visible mold growth observed.
Office 6	Ceiling - Visible water staining, no visible mold growth observed.

9.5 Interpretation of Air Sampling Results

Since there are no regulated exposure threshold levels for molds, the American Conference of Governmental Industrial Hygienists and the United States Environmental Protection Agency guidelines suggest that interpretation of air sampling results should be generally based on comparison of indoor and outdoor spore contents. In addition, it is common industry practice to

compare outside bioaerosol concentrations and species to inside bioaerosol concentrations and species. If the indoor concentration is significantly higher than the outdoor concentration, or if different spore types are present indoors and outdoors, then indoor fungus sources (amplifiers) are presumed to be present. These observations are guidelines only. Variation is an inherent part of airborne spore sampling and the presence of a few different genera in small numbers should not be considered abnormal.

Results of the spore trap samples collected from the areas were compared to samples from the exterior (background) areas. The laboratory results were reviewed by Mr. Kelly and Mr. Waide whom have confirmed a “normal indoor fungal ecology” within the areas. The supporting laboratory data and chain of custody documentation is provided in Appendix C.

9.6 Universal Wastes Inventory

Universal wastes were found within the structures. The descriptions and locations of universal wastes found to be present are summarized in Table 4.

Hazardous Material Location	Hazardous Material Description	Estimated Quantity
Throughout interior	Light ballasts	50
Throughout interior	4' Fluorescent light bulbs	125
Throughout interior	Halogen bulbs	25
Throughout interior	Fire extinguishers	4
Lobby 1	Mercury switch	1
Throughout interior	Exit signs (Tritium)	5
Roof	HVAC Units (Freon)	2

Notes:
 HVAC – heating, ventilation, and air-conditioning
 ' – foot

Please note that the quantities of the Universal Wastes are approximate. It is the contractor’s responsibility to confirm quantities prior to bidding and demolition activities.

10 RECOMMENDATIONS

The following recommendations are provided.

10.1 Asbestos

- The mirrors should be removed in order to determine if the assumed mastic material is present. If present, the assumed ACM mirror mastic should be treated as asbestos-containing or could be sampled and analyzed for asbestos by qualified personnel in order to determine the appropriate handling and disposal requirements. If treated as or confirmed to be ACM, a licensed abatement removal contractor should perform the removal and disposal tasks. The licensed abatement contractor must maintain current licenses as required by applicable state or local jurisdictions for the removal, transporting, disposal, or other regulated activities.

- Applicable laws and regulations should be followed, including those provisions requiring notification to regulatory agencies, building occupants, demolition contractors, and workers of the presence of asbestos.
- Although not a regulatory requirement, asbestos abatement monitoring consulting services should be performed by a third-party environmental consultant, to include oversight of abatement contractor activities to be performed in accordance with the abatement specifications, daily air monitoring, clearances, verification of complete removal of hazardous materials, and preparation of a closeout report summarizing the abatement activities.

10.2 Lead

- The identified LBP within Table 3 should not be disturbed by unauthorized personnel. The required lead paint abatement should be performed by a licensed abatement contractor by certified lead personnel. Any painted LBPs in a non-intact (fair/poor) condition should be stabilized and the substrate should be encapsulated. All lead related removal activities should be performed in accordance with the DOSH Lead in Construction Standard, Title 8 CCR 1532.1.
- Proper LCS waste stream categorization is required for lead components which will be removed. Prior to disposal, a composite sample of the representative LCS material should be analyzed for total lead for comparison with the Total Threshold Limit Concentration in accordance with EPA reference method SW-846. If the concentration of total lead is greater than or equal to 1,000 milligrams per kilogram (mg/kg), the LCS waste material must be disposed at a landfill which can receive such wastes. If the concentration is less than 50 mg/kg the sample may be disposed as construction debris, if it is to remain in California. If the total lead result is greater than or equal to 50 mg/kg and less than 1,000 mg/kg, the sample must be further analyzed for soluble lead by the Waste Extraction Test for comparison with the Soluble Threshold Limit Concentration (STLC) as described in Title 22 CCR 66261.24a. Additionally, if the result is greater than or equal to 100 mg/kg the sample must be further analyzed for leachable lead by the Toxicity Characteristic Leaching Procedure (TCLP) for comparison with the Resource Conservation and Recovery Act (RCRA) limits. Based on the results of the soluble and leachable analysis the waste material may require disposal as a RCRA-Hazardous waste or non-RCRA- (California-) Hazardous waste.
- Although not a regulatory requirement, lead abatement monitoring consulting services should be performed by a third-party environmental consultant, to include oversight of abatement contractor activities to be performed in accordance with the abatement specifications, daily air monitoring, clearances, verification of complete removal of hazardous materials, and preparation of a closeout report summarizing the abatement activities.

10.3 Mold and Other Biological Contaminants

The identified water-stained ceiling tiles do not require mold abatement prior to demolition. However, it is recommended that the water-stained ceiling tiles be removed and replaced if the building is still occupied and in use prior to the planned demolition activities.

10.4 Universal Wastes

Universal wastes discussed in this report (Table 5), should be removed and properly recycled or disposed by the contractor prior to demolition activities. The contractor should provide proper manifesting for all hazardous materials removed and recycled to prove the disposal of all materials was completed in accordance with local, state, and federal requirements.

11 LIMITATIONS

Ninyo & Moore's opinions and recommendations regarding environmental conditions, as presented in this report, are based on limited sampling and chemical analysis. Further assessment of potential adverse environmental impacts may be accomplished by a more comprehensive assessment. The samples collected and used for testing, and the observations made, are believed to be representative of the area(s) evaluated. However, if additional suspect ACMs or LCS are encountered during renovation activities, these materials should be sampled by qualified personnel, and analyzed for content prior to further disturbance. In addition, please note that quantities of ACMs are approximate. These numbers should be confirmed prior to removal or repair activities.

The environmental services described in this report have been conducted in general accordance with current regulatory guidelines and the standard-of-care exercised by environmental consultants performing similar work in the project area. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Variations in site conditions may exist and conditions not observed or described in this report may be encountered during subsequent activities.

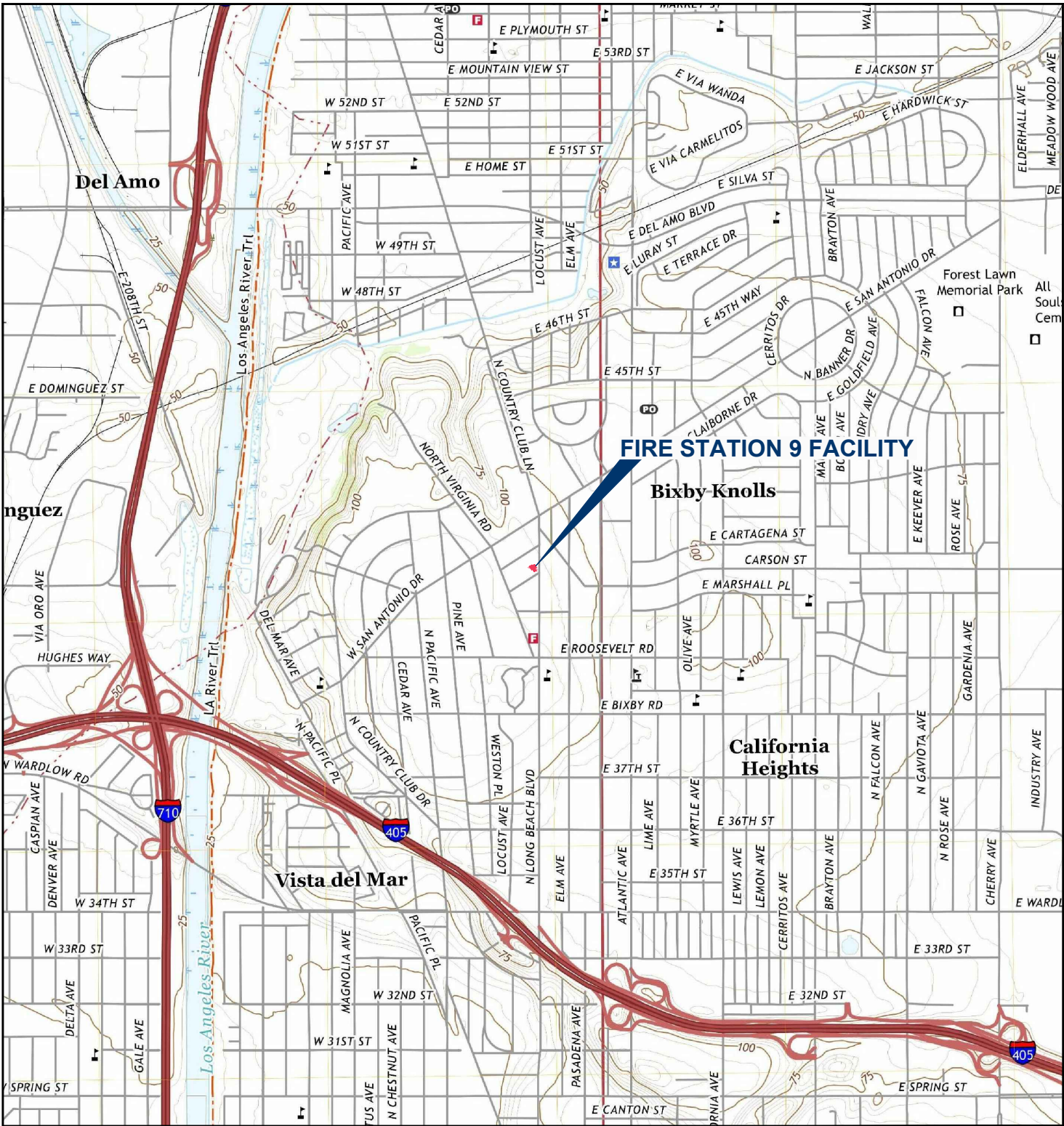
This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires any additional information, or has questions regarding content, interpretations presented, or completeness of this document.

The environmental interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and concentration of specific chemical or physical constituents in samples collected from the subject site. The testing and analyses have been conducted by an independent laboratory which is certified by the State of California to conduct such tests. Ninyo & Moore has no involvement in, or control over, such testing and analysis. Ninyo & Moore, therefore, disclaims responsibility for any inaccuracy in such laboratory results.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. It should be understood that the conditions of a site can change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.



FIGURE



FIRE STATION 9 FACILITY

Bixby Knolls

California Heights

Vista del Mar

Del Amo

nguez

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE. | REFERENCE: USGS, 2021.

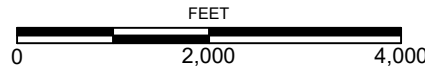


FIGURE 1

SITE LOCATION

4101 LONG BEACH BOULEVARD
LONG BEACH, CALIFORNIA

210042028.dwg 08/07/2023 GK



APPENDIX A

Consultant Certificates

Certificate Of Completion

Asbestos Building Inspector Initial Course

DOSH #:CA-015-05

Lucas Waide

ABII0612230011N35193

Edwin Velasco

Principal Instructor

6/12/2023

Course Start Date

6/14/2023

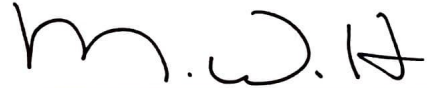
Course End Date

6/14/2023

Exam Date

6/14/2024

Expiration Date



Michael W. Horner

Training Director

This course satisfies the education requirements for Asbestos accreditation under the Toxic Substances Control Act, Title II. This course has been approved by the Department of Industrial Relations, Division of Occupational Safety and Health of the State of California



NATEC International, Inc.

National Association of Training and Environmental Consulting



1100 Technology Circle, Suite A, Anaheim, CA 92805 • www.natecintl.com • 800-969-3228



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH



LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:



Edilberto Quintero

CERTIFICATE TYPE:

Lead Sampling Technician

NUMBER:

LRC-00000274

EXPIRATION DATE:

4/10/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

DEPARTMENT OF INDUSTRIAL RELATIONS
Division of Occupational Safety and Health
Asbestos Certification & Training Unit
1750 Howe Avenue, Suite 460
Sacramento, CA 95815
(916) 574-2993 www.dir.ca.gov/dost/asbestos.html actu@dir.ca.gov



208297217C

473

477

March 28, 2023

David M Kelly
26015 Okuma Road
Manifee CA 92584

Dear Certified Asbestos Consultant or Technician:

Congratulations, you have passed your certification examination!

Enclosed is your certification card. **To maintain your certification, please abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card in accordance with Title 8, California Code of Regulations, Division 1, Chapter 3.2, Article 2.6, Section 341.15(h) (1).

Please keep and do not send copies of your required AHERA refresher renewal certificates to the Division until you apply for renewal of your certification.

Please submit via U.S. Postal Service or other carrier, of any changes in your mailing or work address within 15 days of the change.

Sincerely,

Kevin Graulich
Principal Safety Engineer

Attachment: Certification Card

cc: File





STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH



LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:



David Kelly

CERTIFICATE TYPE:

Lead Sampling Technician

NUMBER:

LRC-00002285

EXPIRATION DATE:

10/22/2023

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD



American Council for Accredited Certification

hereby certifies that

David M. Kelly

has met all the specific standards and qualifications of the re-certification process,
including continued professional development, and is hereby re-certified as a

CRIE

Council-certified
Residential Indoor Environmentalist

This certificate expires on May 31, 2024.

Charles F. Wiles, Executive Director

1605010

Certificate Number

This certificate remains the property of the American Council for Accredited Certification.



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH



LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
	Lead Inspector/Assessor	LRC-00001285	7/3/2024
William Larkin	Lead Project Monitor	LRC-00001284	7/3/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

The Board for Global EHS Credentialing (BGC)

through its vested authority, hereby confirms that

Stephen J. Waide

has met all requirements of education, experience, and examination, and on-going maintenance set forth through the BGC's American Board of Industrial Hygiene® (ABIH®) credentialing division for re-certification in the Comprehensive Practice of Industrial Hygiene and is thereby conferred the credential of

Certified Industrial Hygienist® (CIH®)

The aforementioned individual is given all rights, privileges, and responsibilities as both a diplomate of the BGC and holder of the CIH credential, provided that the credential is not suspended or revoked, and it is renewed annually. Moreover, the holder must meet all recertification requirements, including the obligation to practice ethically as prescribed by the BGC.



Credential Number: 7005 CP

Award Date: December 4, 1995

Expiration Date: June 1, 2027

Alan Leibowitz, CIH, CSP, FAIHA
Chair of the Board of Directors



Ulric K. Chung, MCS, PhD
Chief Executive Officer and Secretary



BOARD FOR GLOBAL EHS CREDENTIALING

6005 W. Saint Joe Hwy., Suite 300 Lansing, Michigan 48917-4876 **P:** (517) 321-2638 **F:** (517) 321-4624 **E:** info@EHSCredentialing.org

December 1, 2021

Stephen J. Waide, CIH
Ninyo & Moore
5710 Ruffin Road
San Diego CA 92123

Dear Stephen J. Waide,

I am pleased to inform you that your Certification Maintenance (CM) worksheet has been reviewed and your professional activities have fulfilled the Board's requirements for recertification. Your new certificate is enclosed.

Your next 60-month CM cycle will be from 1/1/2022 to 12/31/2026. Remember that you can earn CM credit only between your CM Cycle Start Date and End Date.

Key changes during your next CM cycle will be announced via email, which makes having your current email address very important. You can review your contact information, key CM cycle dates and begin entering your activities for your next CM cycle by logging into the *CAPS* system on the ABIH web site (we will no longer be accepting a cm worksheet via excel or paper).

The Board appreciates your continued professional service and support of its programs.

Sincerely,

Pamela J. Trim
Certification Director
517-853-5763
certificationdirector@gobgc.org



ANSI Accredited Program
PERSONNEL CERTIFICATION



International Occupational
Hygiene Association
Recognized Certification Board





APPENDIX B

California Department of Public Health Form 8552

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation July 28, 2023

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

Lead Inspection
 Risk assessment
 Clearance Inspection
 Other (specify)

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]		City	County	Zip Code
4101 Long Beach Boulevard		Long Beach	Los Angeles	90807
Construction date (year) of structure	Type of structure		Children living in structure?	
Unknown	<input type="checkbox"/> Multi-unit building <input type="checkbox"/> School or daycare <input type="checkbox"/> Single family dwelling <input checked="" type="checkbox"/> Other <u>Commercial</u>		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Don't Know	


Section 4 — Owner of Structure (if business/agency, list contact person)

Name		Telephone number	
City of Long Beach		562-570-2855	
Address [number, street, apartment (if applicable)]		City	State
411 West Ocean Boulevard, 5th Floor		Long Beach	California
		Zip Code	
			90802

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

No lead-based paint detected
 Intact lead-based paint detected
 Deteriorated lead-based paint detected
 No lead hazards detected
 Lead-contaminated dust found
 Lead-contaminated soil found
 Other

Section 6 — Individual Conducting Lead Hazard Evaluation

Name		Telephone number	
Edilberto Quintero		949-753-7070	
Address [number, street, apartment (if applicable)]		City	State
475 Goddard, Ste 200		Irvine	CA
		Zip Code	
			92618
CDPH certification number	Signature	Date	
0274		July 28, 2023	

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

- A. A foundation diagram or sketch of the structure indicating the specific locations of each lead hazard or presence of lead-based paint;
- B. Each testing method, device, and sampling procedure used;
- C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector
 Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:
 California Department of Public Health
 Childhood Lead Poisoning Prevention Branch Reports
 850 Marina Bay Parkway, Building P, Third Floor
 Richmond, CA 94804-6403
 Fax: (510) 620-5656



APPENDIX C

Analytical Results and Chain-of-Custody Records



Asbestos Analytical Results and Chain-of-Custody Records

Report for:

David Kelly
Ninyo & Moore - Irvine
475 Goddard
Suite 200
Irvine, CA 92618

Regarding: Eurofins EPK Built Environment Testing, LLC
Project: 210042028; Fire Station 9 4101 Long Beach Boulevard
EML ID: 3334699

Approved by:



Approved Signatory
Danny Li

Dates of Analysis:
Asbestos PLM: 08-02-2023

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EM-AS-S-1267)
NVLAP Lab Code 200757-0

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the samples as received and tested. The results include an inherent uncertainty of measurement associated with estimating percentages by polarized light microscopy. Measurement uncertainty data for sample results with >1% asbestos concentration can be provided when requested.

Eurofins EPK Built Environment Testing, LLC ("the Company"), a member of the Eurofins Built Environment Testing group of companies, shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

Eurofins EPK Built Environment Testing, LLC

2841 Dow Avenue, Suite 300, Tustin, CA 92780

(800) 651-4802 www.eurofinsus.com/Built

Client: Ninyo & Moore - Irvine

C/O: David Kelly

Re: 210042028; Fire Station 9 4101 Long Beach
Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Total Samples Submitted:** 65**Total Samples Analyzed:** 65**Total Samples with Layer Asbestos Content > 1%:** 0**Location: 01, Perapit Wall**

Lab ID-Version‡: 16208851-1

Sample Layers	Asbestos Content
Yellow Foam	ND
Black Non-Fibrous Material	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 02, Perapit Wall

Lab ID-Version‡: 16208852-1

Sample Layers	Asbestos Content
Yellow Foam	ND
Black Non-Fibrous Material	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 03, Perapit Wall

Lab ID-Version‡: 16208853-1

Sample Layers	Asbestos Content
Yellow Foam	ND
Black Non-Fibrous Material	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 04, Roof Core

Lab ID-Version‡: 16208854-1

Sample Layers	Asbestos Content
Yellow Foam	ND
Black Roofing Material	ND
Black Roofing Material 2	ND
Black Roofing Material 3	ND
Black Roofing Material 4	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Poor

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Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

‡ A "Version" indicated by "-x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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ASBESTOS PLM REPORT

Location: 05, Roof Core

Lab ID-Version‡: 16208855-1

Sample Layers	Asbestos Content
Yellow Foam	ND
Black Roofing Material	ND
Black Roofing Material 2	ND
Black Roofing Material 3	ND
Black Roofing Material 4	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Poor

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 C/O: David Kelly
 Re: 210042028; Fire Station 9 4101 Long Beach
 Boulevard

Date of Sampling: 07-28-2023
 Date of Receipt: 07-28-2023
 Date of Report: 08-02-2023

ASBESTOS PLM REPORT

Location: 06, Roof Core

Lab ID-Version‡: 16208856-1

Sample Layers	Asbestos Content
Yellow Foam	ND
Black Roofing Material	ND
Black Roofing Material 2	ND
Black Roofing Material 3	ND
Black Roofing Material 4	ND
Composite Non-Asbestos Content:	10% Glass Fibers
Sample Composite Homogeneity:	Poor

Location: 07, Flashing Mastic

Lab ID-Version‡: 16208857-1

Sample Layers	Asbestos Content
Gray Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 08, Flashing Mastic

Lab ID-Version‡: 16208858-1

Sample Layers	Asbestos Content
Gray Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 09, Flashing Mastic

Lab ID-Version‡: 16208859-1

Sample Layers	Asbestos Content
Gray Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

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ASBESTOS PLM REPORT**Location: 10, Penetration Mastic**

Lab ID-Version‡: 16208860-1

Sample Layers	Asbestos Content
Black Mastic	ND
Yellow Foam	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 11, Penetration Mastic

Lab ID-Version‡: 16208861-1

Sample Layers	Asbestos Content
Black Mastic	ND
Yellow Foam	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 12, Penetration Mastic

Lab ID-Version‡: 16208862-1

Sample Layers	Asbestos Content
Black Mastic	ND
Yellow Foam	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 13, Ducting Mastic

Lab ID-Version‡: 16208863-1

Sample Layers	Asbestos Content
Gray Mastic	ND
Sample Composite Homogeneity:	Moderate

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Boulevard

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ASBESTOS PLM REPORT

Location: 14, Ducting Mastic

Lab ID-Version‡: 16208864-1

Sample Layers	Asbestos Content
Gray Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 15, Ducting Mastic

Lab ID-Version‡: 16208865-1

Sample Layers	Asbestos Content
Gray Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 16, Mortar (Stone Wall)

Lab ID-Version‡: 16208866-1

Sample Layers	Asbestos Content
Yellow Cementitious Material	ND
Gray Mortar	ND
Sample Composite Homogeneity: Poor	

Location: 17, Mortar (Stone Wall)

Lab ID-Version‡: 16208867-1

Sample Layers	Asbestos Content
Yellow Cementitious Material	ND
Gray Mortar	ND
Sample Composite Homogeneity: Poor	

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ASBESTOS PLM REPORT**Location: 18, Mortar (Stone Wall)**

Lab ID-Version‡: 16208868-1

Sample Layers	Asbestos Content
Yellow Cementitious Material	ND
Gray Mortar	ND
Sample Composite Homogeneity: Poor	

Location: 19, Window Door Caulking

Lab ID-Version‡: 16208869-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity: Moderate	

Location: 20, Window Door Caulking

Lab ID-Version‡: 16208870-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity: Moderate	

Location: 21, Window Door Caulking

Lab ID-Version‡: 16208871-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity: Moderate	

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ASBESTOS PLM REPORT**Location: 22, Stucco**

Lab ID-Version‡: 16208872-1

Sample Layers	Asbestos Content
White Stucco	ND
Gray Stucco	ND
Black Vapor Barrier	ND
Composite Non-Asbestos Content:	30% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 23, Stucco

Lab ID-Version‡: 16208873-1

Sample Layers	Asbestos Content
White Stucco	ND
Gray Stucco	ND
Black Vapor Barrier	ND
Composite Non-Asbestos Content:	30% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 24, Stucco

Lab ID-Version‡: 16208874-1

Sample Layers	Asbestos Content
White Stucco	ND
Gray Stucco	ND
Black Vapor Barrier	ND
Composite Non-Asbestos Content:	30% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 25, Concrete

Lab ID-Version‡: 16208875-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

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ASBESTOS PLM REPORT**Location: 26, Concrete**

Lab ID-Version‡: 16208876-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 27, Concrete

Lab ID-Version‡: 16208877-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 28, Plaster

Lab ID-Version‡: 16208878-1

Sample Layers	Asbestos Content
Light Gray Plaster	ND
Gray Plaster	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 29, Plaster

Lab ID-Version‡: 16208879-1

Sample Layers	Asbestos Content
Light Gray Plaster	ND
Gray Plaster	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

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ASBESTOS PLM REPORT**Location: 30, Plaster**

Lab ID-Version‡: 16208880-1

Sample Layers	Asbestos Content
Light Gray Plaster	ND
Gray Plaster	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 31, White Caulking

Lab ID-Version‡: 16208881-1

Sample Layers	Asbestos Content
White Caulk	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 32, White Caulking

Lab ID-Version‡: 16208882-1

Sample Layers	Asbestos Content
White Caulk	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 33, White Caulking

Lab ID-Version‡: 16208883-1

Sample Layers	Asbestos Content
White Caulk	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

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ASBESTOS PLM REPORT

Location: 34, Gray 3"

Lab ID-Version‡: 16208884-1

Sample Layers	Asbestos Content
Gray Baseboard	ND
White Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 35

Lab ID-Version‡: 16208885-1

Sample Layers	Asbestos Content
Gray Baseboard	ND
White Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 36

Lab ID-Version‡: 16208886-1

Sample Layers	Asbestos Content
Gray Baseboard	ND
White Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 37

Lab ID-Version‡: 16208887-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Orange Mastic	ND
Composite Non-Asbestos Content: < 1% Cellulose	
Sample Composite Homogeneity: Moderate	

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Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Location: 38**

Lab ID-Version‡: 16208888-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Orange Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 39

Lab ID-Version‡: 16208889-1

Sample Layers	Asbestos Content
Gray Floor Tile	ND
Orange Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 40

Lab ID-Version‡: 16208890-1

Sample Layers	Asbestos Content
Beige Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	40% Cellulose 40% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 41

Lab ID-Version‡: 16208891-1

Sample Layers	Asbestos Content
Beige Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	40% Cellulose 40% Glass Fibers
Sample Composite Homogeneity:	Moderate

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 Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Location: 42**

Lab ID-Version‡: 16208892-1

Sample Layers	Asbestos Content
Beige Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	40% Cellulose 40% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 43

Lab ID-Version‡: 16208893-1

Sample Layers	Asbestos Content
Beige Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	40% Cellulose 40% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 44

Lab ID-Version‡: 16208894-1

Sample Layers	Asbestos Content
Beige Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	40% Cellulose 40% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 45

Lab ID-Version‡: 16208895-1

Sample Layers	Asbestos Content
White Grout	ND
Tan Thinset	ND
Sample Composite Homogeneity:	Moderate

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‡ A "Version" indicated by "-x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Eurofins EPK Built Environment Testing, LLC

2841 Dow Avenue, Suite 300, Tustin, CA 92780

(800) 651-4802 www.eurofinsus.com/Built

Client: Ninyo & Moore - Irvine

C/O: David Kelly

Re: 210042028; Fire Station 9 4101 Long Beach
Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Location: 46**

Lab ID-Version‡: 16208896-1

Sample Layers	Asbestos Content
White Grout	ND
Tan Thinset	ND
Sample Composite Homogeneity: Moderate	

Location: 47

Lab ID-Version‡: 16208897-1

Sample Layers	Asbestos Content
White Grout	ND
Tan Thinset	ND
Sample Composite Homogeneity: Moderate	

Location: 48

Lab ID-Version‡: 16208898-1

Sample Layers	Asbestos Content
White Ceramic Tile	ND
Gray Grout /Thinset	ND
Sample Composite Homogeneity: Moderate	

Location: 49

Lab ID-Version‡: 16208899-1

Sample Layers	Asbestos Content
White Ceramic Tile	ND
Gray Grout /Thinset	ND
Sample Composite Homogeneity: Moderate	

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Client: Ninyo & Moore - Irvine

C/O: David Kelly

Re: 210042028; Fire Station 9 4101 Long Beach
Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Location: 50**

Lab ID-Version‡: 16208900-1

Sample Layers	Asbestos Content
White Ceramic Tile	ND
Gray Grout /Thinset	ND
Sample Composite Homogeneity:	Moderate

Location: 51

Lab ID-Version‡: 16208901-1

Sample Layers	Asbestos Content
White Coating	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 52

Lab ID-Version‡: 16208902-1

Sample Layers	Asbestos Content
White Coating	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 53

Lab ID-Version‡: 16208903-1

Sample Layers	Asbestos Content
White Coating	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Moderate

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Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Location: 54**

Lab ID-Version‡: 16208904-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 55

Lab ID-Version‡: 16208905-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 56

Lab ID-Version‡: 16208906-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 57

Lab ID-Version‡: 16208907-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

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C/O: David Kelly

Re: 210042028; Fire Station 9 4101 Long Beach
Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT**Location: 58**

Lab ID-Version‡: 16208908-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 59

Lab ID-Version‡: 16208909-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 60

Lab ID-Version‡: 16208910-1

Sample Layers	Asbestos Content
Off-White Joint Compound	ND
White Drywall with Brown Paper	ND
Composite Non-Asbestos Content:	3% Cellulose < 1% Glass Fibers
Sample Composite Homogeneity:	Moderate

Location: 61

Lab ID-Version‡: 16208911-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity:	Moderate

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Client: Ninyo & Moore - Irvine
C/O: David Kelly
Re: 210042028; Fire Station 9 4101 Long Beach
Boulevard

Date of Sampling: 07-28-2023

Date of Receipt: 07-28-2023

Date of Report: 08-02-2023

ASBESTOS PLM REPORT

Location: 62

Lab ID-Version‡: 16208912-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 63

Lab ID-Version‡: 16208913-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 64

Lab ID-Version‡: 16208914-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Moderate	

Location: 65

Lab ID-Version‡: 16208915-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Moderate	

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ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 Tel: (949) 753-7070 Fax: (949) 753-7071	Project Name : Fire Station 9 Address: 4101 Long Beach Boulevard Long Beach, CA Project No: 210042028 Project Manager: David Kelly	Date Sampled: Sampled By: Edilberto Quintero Sampled By: Date Sampled: 07/28/2023	Laboratory: Eurofins Built Tel: Fax:
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CHAIN OF CUSTODY INFORMATION: Email: dkelly@ninyoandmoore.com, equintero@ninyoandmoore.com

Analysis: **PLM EPA 600/R-93/116** TAT: Standard

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
<i>[Signature]</i> /Edilberto Quintero	Ninyo & Moore	7/28/23	1230	<i>[Signature]</i> John Tang	7/28/23 JPM

Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
01	4101	Roof (N)	1	Perapit Wall	660SF	N	G
02		(E)		↓	↓	↓	↓
03		(W)		↓	↓	↓	↓
04		(N)	2	Roof Core	6,500SF	N	G
05		(E)		↓	↓	↓	↓
06		(S)		↓	↓	↓	↓
07		(E)	3	Flashing Mastic	8SF	N	G
08		(S)		↓	↓	↓	↓
09		(W)		↓	↓	↓	↓
10		(E)	4	Penetration Mastic	7SF	N	G
11		(S)		↓	↓	↓	↓
12		(W)		↓	↓	N	↓
13		(N)	5	Ducting Mastic	12SF	N	G

3334699

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 Tel: (949) 753-7070 Fax: (949) 753-7071	Project Name : Fire Station 9 Address: 4101 Long Beach Boulevard Long Beach, CA Project No: 210042028 Project Manager: David Kelly	Date Sampled: Sampled By: Edilberto Quintero Sampled By: Date Sampled: 07/28/2023	Laboratory: Eurofins Built Tel: Fax:
--	--	---	---

CHAIN OF CUSTODY INFORMATION: Email: dkelly@ninyoandmoore.com, equintero@ninyoandmoore.com

Analysis: **PLM EPA 600/R-93/116** TAT: Standard

Relinquished By: (sign/print)	Company	Date	Time(24 hr)	Received By: (sign/print)	Laboratory
Edilberto Quintero	Ninyo & Moore	7/28/23	1030	Johnfang	7/28/23 1pm

Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
14	4101	Roof (S)	5	Ducting Mastic	12 SF	N	G
15		↓ (W)	↓	↓	↓	↓	↓
16		Exterior (Northwest)	6	Mortar (Stone Wall)	650 SF	N	G
17		↓ (Northeast)	↓	↓	↓	↓	↓
18		↓ (Center)	↓	↓	↓	↓	↓
19		Exterior (South)	7	Window/Door Caulking	8 SF	N	G
20		(West)	↓	↓	↓	↓	↓
21		(North)	↓	↓	↓	↓	↓
22		Exterior (N)	8	Stucco	3,300 SF	N	G
23		(E)	↓	↓	↓	↓	↓
24		(S)	↓	↓	↓	↓	↓
25		Exterior (E)	9	Concrete	8,000 SF	N	G
26		(S)	↓	↓	↓	↓	↓

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ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 Tel: (949) 753-7070 Fax: (949) 753-7071	Project Name : Fire Station 9 Address: 4101 Long Beach Boulevard Long Beach, CA Project No: 210042028 Project Manager: David Kelly	Date Sampled: Sampled By: Edilberto Quintero Sampled By: Date Sampled: 07/28/2023	Laboratory: Eurofins Built Tel: Fax:
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CHAIN OF CUSTODY INFORMATION: Email: dkelly@ninyoandmoore.com, equintero@ninyoandmoore.com

Analysis: **PLM EPA 600/R-93/116** TAT: Standard

Relinquished By: (sign/print)	Company	Date	Time(24 hr)	Received By: (sign/print)	Laboratory
/Edilberto Quintero	Ninyo & Moore	7/28/23	1230	John Kang	7/28/23 1pm

Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
27	4101	Exterior (w)	9	Concrete	8,000 SF	N	G
28	↓	Garage Wall (w)	10	Plaster	700 SF	N	G
29		↓	↓	↓	↓	↓	↓
30		↓	↓	↓	↓	↓	↓
31		↓	↓	↓	↓	↓	↓
32		↓	↓	↓	↓	↓	↓
33		↓	↓	↓	↓	↓	↓
34		↓	↓	↓	↓	↓	↓
35		↓	↓	↓	↓	↓	↓
36		↓	↓	↓	↓	↓	↓
37		↓	↓	↓	↓	↓	↓
38	↓	↓	↓	↓	↓	↓	
39	↓	↓	↓	↓	↓	↓	

3334649

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 Tel: (949) 753-7070 Fax: (949) 753-7071	Project Name : Fire Station 9 Address: 4101 Long Beach Boulevard Long Beach, CA Project No: 210042028 Project Manager: David Kelly	Date Sampled: Sampled By: Edilberto Quintero Sampled By: Date Sampled: 07/28/2023	Laboratory: Eurofins Built Tel: Fax:
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CHAIN OF CUSTODY INFORMATION: Email: dkelly@ninyoandmoore.com, equintero@ninyoandmoore.com

Analysis: **PLM EPA 600/R-93/116** TAT: Standard

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
 Edilberto Quintero	Ninyo & Moore	7/28/23	12:30	 Sohn Kang	7/28/23 lpm

Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
40	4101	Kitchen	14	2x4 laid-in ceiling tile	1500SF	N	G
41	↓	Office 3	↓	↓	↓	↓	↓
42		↓	↓	↓	↓	↓	↓
43		↓	↓	↓	↓	↓	↓
44		↓	↓	↓	↓	↓	↓
45		Lobby 2	15	Ceramic Floor Tile (Grout & Thinset)	200SF	N	G
46	↓	Meeting Room	↓	↓	↓	↓	↓
47		↓	↓	↓	↓	↓	↓
48		R.R. 1	16	R.R. 1 Shower Tile (Grout & Thinset)	50SF	N	G
49	↓	↓	↓	↓	↓	↓	↓
50		↓	↓	↓	↓	↓	↓
51		Office 5	17	White undersink coating	3 SF	Y	G
52	↓	Office 6	↓	↓	↓	↓	↓

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ASBESTOS BULK SAMPLE DATA SHEET

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Analysis: **PLM EPA 600/R-93/116** TAT: Standard

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
<i>[Signature]</i> Edilberto Quintero	Ninyo & Moore	7/28/23	10:40	<i>[Signature]</i> John Kang	7/28/23 1pm

Sample ID	Building Number	Sample Location	HA No.	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
53	4101	Office 6	17	White undersink coating	3 SF	Y	G
54	↓	Kitchen Wall	18	Drywall w/ JC	7500 SF	Y/N	G
55		Office 9 Wall	↓	↓	↓	↓	↓
56		Office 3 Wall	↓	↓	↓	↓	↓
57		Office 6 Ceiling	↓	↓	↓	↓	↓
58		Office 7 Ceiling	↓	↓	↓	↓	↓
59		Storage Wall	↓	↓	↓	↓	↓
60		Office 8 Wall	↓	↓	↓	↓	↓
61		Lobby 1	19	Carpet glue	3,000 SF	N	G
62		Lobby 2	↓	↓	↓	↓	↓
63		Storage	↓	↓	↓	↓	↓
64	Office 1	↓	↓	↓	↓	↓	
65	Hallway	↓	↓	↓	↓	↓	

3334699



Mold Analytical Results and Chain-of-Custody Records



LA Testing

5431 Industrial Drive Huntington Beach, CA 92649

Tel/Fax: (714) 828-4999 / (714) 828-4944

<http://www.LATesting.com> / hblab@latesting.com

EMSL Order: 332313554

Customer ID: 32ninm50

Customer PO:

Project ID:

Attention: David Kelly

Ninyo & Moore

475 Goddard

Suite 200

Irvine, CA 92618

Project: FIRE STATION 9 / 210042028

Phone: (949) 753-7070

Fax:

Collected Date: 08/04/2023

Received Date: 08/04/2023 09:15 AM

Analyzed Date: 08/09/2023

Test Report: Air-O-Cell™ Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	332313554-0001			332313554-0002			332313554-0003		
Client Sample ID:	A-01			A-02			A-03		
Volume (L):	75			75			75		
Sample Location:	MAIN LOBBY			OFFICE 6			EXTERIOR UPWIND		
Spore Types	Raw Count	Count/m ³	% of Total	Raw Count	Count/m ³	% of Total	Raw Count	Count/m ³	% of Total
Alternaria (Ulocladium)	-	-	-	-	-	-	1*	10*	0.6
Ascospores	-	-	-	1	40	3.8	2	90	5.3
Aspergillus/Penicillium	2	90	47.4	1	40	3.8	6	300	17.6
Basidiospores	-	-	-	1	40	3.8	12	530	31.2
Bipolaris++	-	-	-	1	40	3.8	-	-	-
Chaetomium++	-	-	-	-	-	-	-	-	-
Cladosporium	3	100	52.6	19	840	79.2	17	760	44.7
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	1*	10*	0.9	-	-	-
Fusarium++	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	1	40	3.8	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	1*	10*	0.9	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Torula++	-	-	-	-	-	-	1*	10*	0.6
Total Fungi	5	190	100	26	1060	100	39	1700	100
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	1*	10*	-	-	-	-
Pollen	-	-	-	2	90	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	1	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Cheryl Replogle, Assistant Microbiology Regional Manager
or other Approved Signatory

No discernable field blank was submitted with this group of samples.

LA Testing maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by LA Testing. LA Testing bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. High levels of background particulate can obscure spores and other particulates, leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. **** Denotes particles found at 300X. "-" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. Skin & Fibrous ratings: 1 (1-25%), 2 (26-50%), 3 (51-75%), 4 (76-100%) of the background particles.

Samples analyzed by LA Testing Huntington Beach, CA AIHA LAP, LLC-EMLAP Accredited #101650

Initial report from: 08/09/2023 09:30 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com



LA Testing

5431 Industrial Drive Huntington Beach, CA 92649

Tel/Fax: (714) 828-4999 / (714) 828-4944

<http://www.LATesting.com> / hblab@lateesting.com

EMSL Order: 332313554

Customer ID: 32ninm50

Customer PO:

Project ID:

Attention: David Kelly

Ninyo & Moore

475 Goddard

Suite 200

Irvine, CA 92618

Project: FIRE STATION 9 / 210042028

Phone: (949) 753-7070

Fax:

Collected Date: 08/04/2023

Received Date: 08/04/2023 09:15 AM

Analyzed Date: 08/09/2023

Test Report: Air-O-Cell™ Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	332313554-0004		
Client Sample ID:	A-04		
Volume (L):	75		
Sample Location:	EXTERIOR DOWNWIND		
Spore Types	Raw Count	Count/m³	% of Total
Alternaria (Ullocladium)	-	-	-
Ascospores	1	40	2.5
Aspergillus/Penicillium	4	200	12.4
Basidiospores	9	400	24.8
Bipolaris++	-	-	-
Chaetomium++	-	-	-
Cladosporium	19	840	52.2
Curvularia	-	-	-
Epicoccum	-	-	-
Fusarium++	-	-	-
Ganoderma	2	90	5.6
Myxomycetes++	-	-	-
Pithomyces++	-	-	-
Rust	1	40	2.5
Scopulariopsis/Microascus	-	-	-
Stachybotrys/Memnoniella	-	-	-
Unidentifiable Spores	-	-	-
Zygomycetes	-	-	-
Torula++	-	-	-
Total Fungi	36	1610	100
Hyphal Fragment	-	-	-
Insect Fragment	-	-	-
Pollen	-	-	-
Analyt. Sensitivity 600x	-	44	-
Analyt. Sensitivity 300x	-	13*	-
Skin Fragments (1-4)	-	-	-
Fibrous Particulate (1-4)	-	1	-
Background (1-5)	-	1	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Cheryl Replogle, Assistant Microbiology Regional Manager
or other Approved Signatory

No discernable field blank was submitted with this group of samples.

LA Testing maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by LA Testing. LA Testing bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. High levels of background particulate can obscure spores and other particulates, leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. **** Denotes particles found at 300X. "-" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. Skin & Fibrous ratings: 1 (1-25%), 2 (26-50%), 3 (51-75%), 4 (76-100%) of the background particles.

Samples analyzed by LA Testing Huntington Beach, CA AIHA LAP, LLC-EMLAP Accredited #101650

Initial report from: 08/09/2023 09:30 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com



Microbiology Chain of Custody Form

LA Testing Order Number / Lab Use Only

LA Testing
5431 Industrial Drive
Huntington Beach, CA 92649

#332313554

PHONE: (714) 828-4999

EMAIL: huntingonbeachlab@latesting.com

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information	Customer ID:	Billing ID:
	Company Name: <u>Ninyo and Moore</u>	Company Name: <u>Same as Customer info.</u>
	Contact Name: <u>David Kelly</u>	Billing Contact:
	Street Address: <u>475 Goddard St. 200</u>	Street Address:
	City, State, Zip: <u>Irvine CA, US</u>	City, State, Zip: _____ Country: _____
	Phone:	Phone:
Email(s) for Report: <u>dkelly@ninyoandmoore.com</u>	Email(s) for Invoice:	

Project Information

Project Name/No: Fire Station 9/210042028 Purchase Order: _____

LAT LIMS Project ID: _____ State: CA Zip Code: 90807 State of Connecticut (CT) must select project location:
 Commercial (Taxable) Residential (Non-taxable)

Sampled By Name: Edilberto Quintero Sampled By Signature: [Signature] No. of Samples in Shipment: 4

Sterile, Sodium Thiosulfate Preserved Bottle Used: Biocide Used in Source (specify): _____
 Public Water Supply Samples: Note: All results may automatically be reported to DOH if required by State.

Turn-Around-Time (TAT) Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

3 Hour 6 Hour 24 Hour 32* Hour 48 Hour 72 Hour 96 Hour 1 Week 2 Week

MICROBIOLOGY TEST CODES

M001 Air-O-Cell	M174 MoldSnap	M012 Pseudomonas aeruginosa (P/A***)	M115 Sewage Screen - Water (P/A***)
M030 MICRO 5	M032 Allergenco-D	M024 Pseudomonas aeruginosa (MFT*)	M116 Sewage Screen - Water (MPN**)
M041 Fungal Direct Examination		M015 Heterotrophic Plate Count	M117 Sewage Screen - Swab (P/A***)
M169 Pollen ID & Enumeration		M017 Total Coliform & E. Coli (Colilert P/A***)	M013 Sewage Screen - Swab (MFT*)
M280 Dust Characterization Level-1		M018 Total Coliform & E. Coli (MFT*)	M730 Methicillin-resistant Staph. aureus (MRSA)
M281 Dust Characterization Level-2		M114 Total Coliform & E. Coli Enumeration (Colilert MPN**)	M031 Rapid-growing non-TB Mycobacteria Detection & Enumeration
M005 Viable Fungi-Air Samples (Genus ID & Count)		M019 Fecal Coliform (MFT*)	M014 Endotoxin Analysis
M006 Viable Fungi-Air Samples (Includes Penicillium, Aspergillus, Cladosporium, Stachybotrys Species ID & Count)		M020 Fecal Streptococcus (MFT*)	M044 Group Allergen (Cat, Dog, Cockroach, Dust Mite)
M007 Culturable Fungi-Surface Samples (Genus ID & Count)		M029 Enterococci (MFT*)	M095 Bacteroides
M008 Culturable Fungi-Surface Samples (Includes Penicillium, Aspergillus, Cladosporium, Stachybotrys Species ID & Count)		M129 Enterococci (Enterolert P/A***)	Other - See Analytical Price Guide for Test Code
M009 Bacteria Culture Gram Stain & Count		M180 Real Time qPCR-ERMI 36 Panel	Legionella Analysis Please use EMSL Legionella COC
M010 Bacteria Count & ID - 3 Most Prominent		M025 Sewage Screen - Water (MFT*)	
M011 Bacteria Count & ID - 5 Most Prominent		*MFT= Membrane Filtration Technique	
		**MPN = Most Probable Number	
		***P/A = Presence/Absence	

Sample #	Sample Location/Description	Sample Type (Matrix)	Potable / Non-Potable (Only for Water)	Test Code	Volume/Area	Date / Time Collected	Temperature (Lab Use Only)
Example: Sample 1	Kitchen	Water	Potable	M017	1,000 ml	1/1/2021 3:30pm	
A-01	main Lobby	Air	-	M001	75 L	8/4/23 7:00	
A-02	Office 6	↓	-	↓	↓	7:10	
A-03	Exterior Upwind	↓	-	↓	↓	7:20	
A-04	↓ Downwind	↓	-	↓	↓	7:30	

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)
EG 8/4/23

Method of Shipment: _____ Sample Condition Upon Receipt: _____

Relinquished by: Edilberto Quintero / E Quintero Date/Time: 8/4/23 / 8:30
 Received by: ROCIO OCHOA RO (DOB) Date/Time: 8/4/23 9:15

Controlled Document - COC-34 LAT Micro R10 02/26/2021 AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc. (DBA LA Testing) Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to LA Testing constitutes acceptance and acknowledgment of all terms and conditions by Customer.



APPENDIX D

Photographs



Photograph 1: View of the building located at 4101 Long Beach Boulevard.



Photograph 2: General view of the roof.

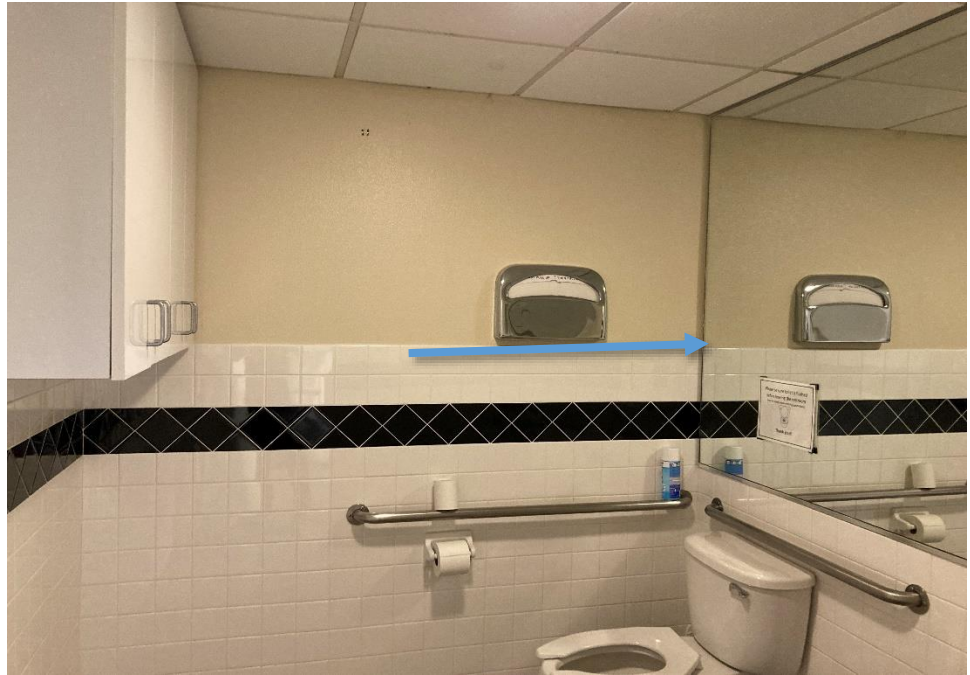
FIGURE D-1



Photograph 3: General view of the interior.



Photograph 4: General view of the interior offices.



Photograph 5: Representative view of the assumed asbestos-containing mirror mastic associated with the mirrors in the restrooms.



Photograph 6: View of the lead containing white paint in the parking-lot.



Photograph 7: View of the lead containing blue ceramic tile in Restroom 1.



Photograph 8: View of the lead containing ceramic countertop in Restroom 1.

FIGURE D-4



Photograph 9: Representative view of the water damage in the Storage room.



Photograph 10: Representative view of the water damage in Lobby 1.

FIGURE D-5

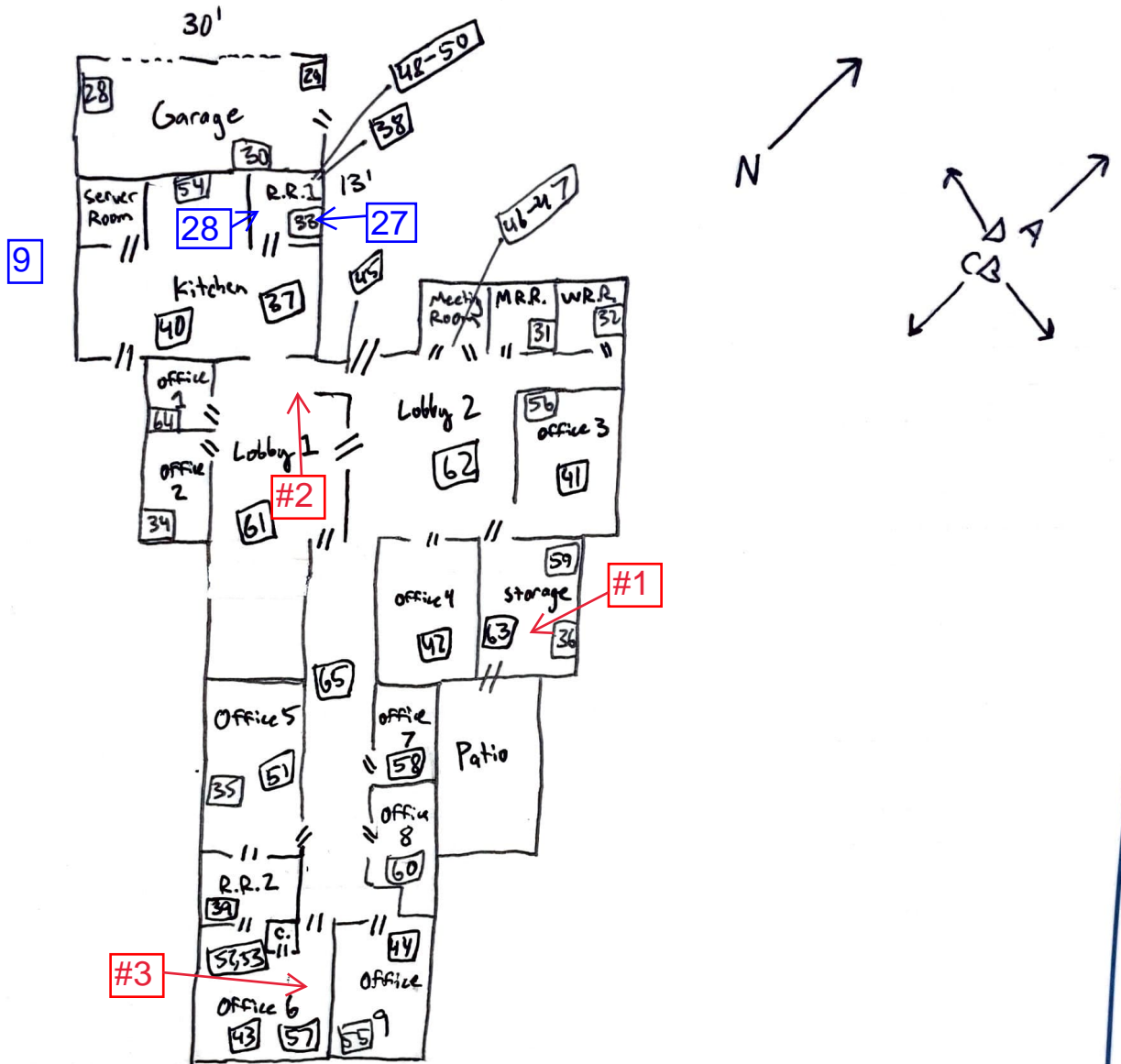


Photograph 11: Representative view of water damage in Office 6.

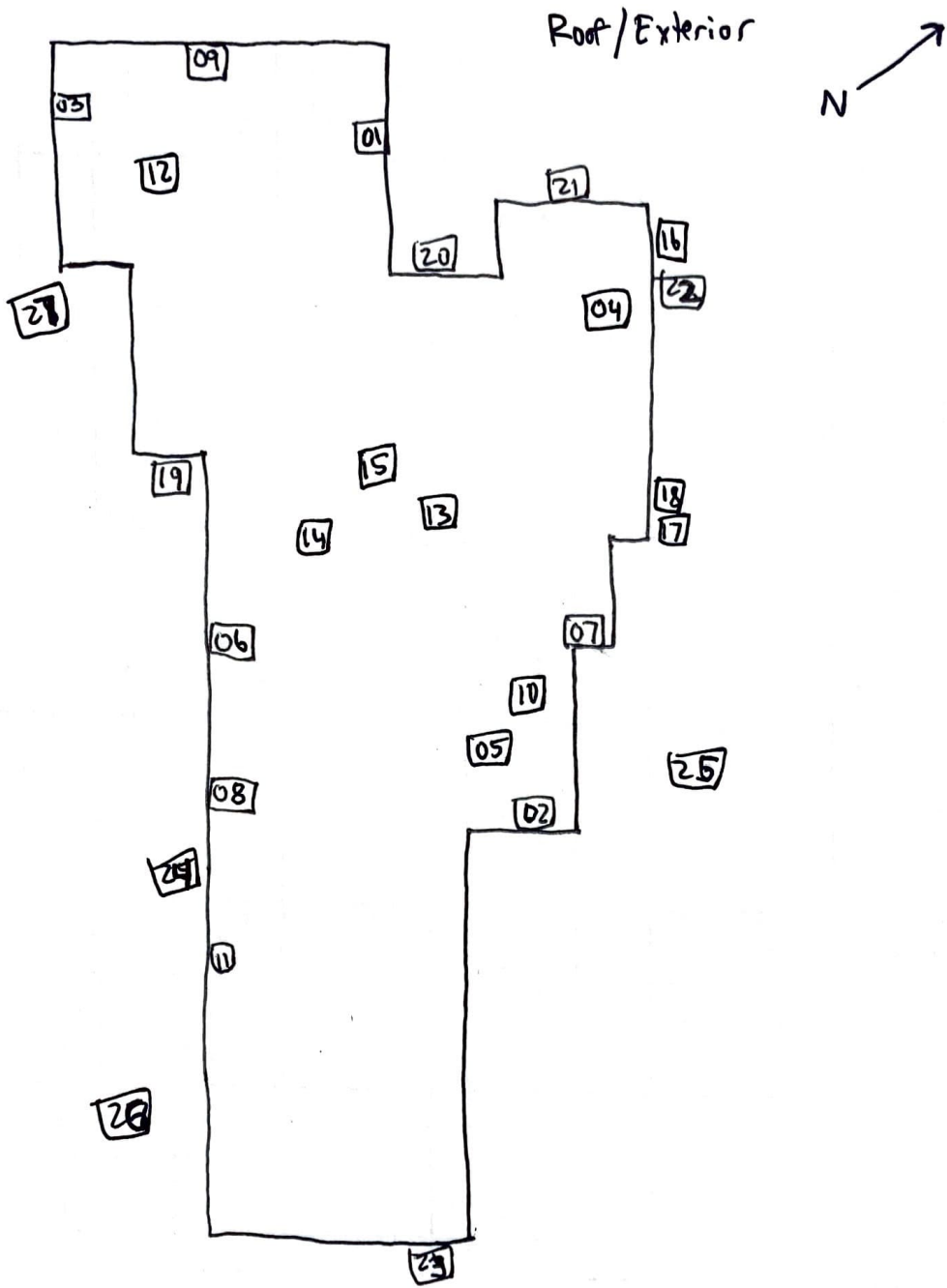


APPENDIX E

Field Drawings



- Suspect Asbestos Sample Location
 # - Visible Water Damage Location
 # - Positive Lead XRF Locations



- Suspect Asbestos Sample Location
- Visible Water Damage Location
- Positive Lead XRF Locations



APPENDIX F

XRF Readings Summary

XRF Readings Summary

Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm ²)	Results	Approximate Quantity	Lead Reading (mg/cm ²)
1	Start	Standard Calibration Check 1.04 +/- 0.06 mg/cm ²						1.0	Positive	N/A	1.0
2		Standard Calibration Check 1.04 +/- 0.06 mg/cm ²						1.0	Positive	N/A	1.1
3		Standard Calibration Check 1.04 +/- 0.06 mg/cm ²						1.0	Positive	N/A	1.0
4101 Long Beach Boulevard											
4	Exterior	1	A	Wall	Stucco	Intact	Brown	0.7	Negative	N/A	0.0
5	Exterior	1	B	Wall	Stucco	Intact	Brown	0.7	Negative	N/A	0.0
6	Exterior	1	C	Wall	Stucco	Intact	Brown	0.7	Negative	N/A	0.0
7	Exterior	1	D	Wall	Stucco	Intact	Brown	0.7	Negative	N/A	0.0
8	Exterior	1	C	Floor	Concrete	Intact	Red	0.7	Negative	N/A	0.0
9	Exterior - parking lot	1	C	Floor	Concrete	Intact	White	0.7	Positive	20 SF	1.3
10	Exterior	1	A	Floor	Concrete	Intact	Blue	0.7	Negative	N/A	0.0
11	Exterior	1	A	Floor	Concrete	Intact	Green	0.7	Negative	N/A	0.0
12	Exterior	1	C	Parking Post	Concrete	Intact	Yellow	0.7	Negative	N/A	0.1
13	Exterior	1	A	Garage Door	Metal	Intact	White	0.7	Negative	N/A	0.0
14	Exterior	1	C	Gate	Metal	Intact	Brown	0.7	Negative	N/A	0.0
15	Roof	2	B	Flashing	Metal	Intact	Gray	0.7	Negative	N/A	0.0
16	Garage	1	D	Door	Metal	Intact	Black	0.7	Negative	N/A	0.0
17	Garage	1	D	Door frame	Metal	Intact	Black	0.7	Negative	N/A	0.0
18	Garage	1	B	Wall	Plaster	Intact	Beige	0.7	Negative	N/A	0.0
19	Garage	1	A	Wall	Drywall	Intact	Beige	0.7	Negative	N/A	0.0
20	Kitchen	1	C	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
21	Kitchen	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
22	Kitchen	1	B	Cabinets	Wood	Intact	Gray	0.7	Negative	N/A	0.0
23	Server Room	1	D	Door	Wood	Intact	White	0.7	Negative	N/A	0.0
24	Server Room	1	D	Door frame	Wood	Intact	White	0.7	Negative	N/A	0.0
25	Server Room	1	B	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
26	Server Room	1	C	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
27	Restroom 1	1	B	Shower tile	Ceramic	Intact	Blue	0.7	Positive	100 SF	7.5
28	Restroom 1	1	D	Countertop	Ceramic	Intact	Blue	0.7	Positive	25 SF	7.5
29	Restroom 1	1	A	Toilet	Porcelain	Intact	White	0.7	Negative	N/A	0.0
30	Restroom 1	1	C	Sink	Porcelain	Intact	White	0.7	Negative	N/A	0.0
31	Restroom 1	1	A	Wall	Plaster	Intact	Yellow	0.7	Negative	N/A	0.0
32	Restroom 1	1	B	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
33	Lobby 1	1	C	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
34	Lobby 1	1	C	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
35	Lobby 1	1	B	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
36	Lobby 1	1	B	Countertop	Ceramic	Intact	Black	0.7	Negative	N/A	0.0
37	Office 1	1	C	Door	Metal	Intact	Black	0.7	Negative	N/A	0.0
38	Office 1	1	C	Door frame	Metal	Intact	Black	0.7	Negative	N/A	0.0
39	Office 1	1	C	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
40	Office 1	1	D	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
41	Office 1	1	A	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
42	Office 1	1	C	Window frame	Metal	Intact	White	0.7	Positive	N/A	0.0
43	Office 2	1	C	Door	Metal	Intact	Black	0.7	Negative	N/A	0.0
44	Office 2	1	C	Door frame	Metal	Intact	Black	0.7	Negative	N/A	0.0

XRF Readings Summary

Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm ²)	Results	Approximate Quantity	Lead Reading (mg/cm ²)
45	Office 2	1	C	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
46	Office 2	1	D	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
47	Office 2	1	A	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
48	Office 2	1	C	Window frame	Metal	Intact	White	0.7	Negative	N/A	0.0
49	Lobby 2	1	D	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
50	Lobby 2	1	B	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
51	Lobby 2	1	A	Floor	Ceramic	Intact	Tan	0.7	Negative	N/A	0.0
52	Meeting Room	1	D	Wall	Drywall	Intact	Yellow	0.7	Positive	N/A	0.0
53	Meeting Room	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.1
54	Meeting Room	1	D	Window frame	Metal	Intact	Stain	0.7	Negative	N/A	0.0
55	Meeting Room	1	D	Fascia	Wood	Intact	Stain	0.7	Negative	N/A	0.0
56	Men's Restroom	1	D	Wall	Ceramic	Intact	White	0.7	Negative	N/A	0.0
57	Men's Restroom	1	D	Wall	Ceramic	Intact	Black	0.7	Positive	N/A	0.0
58	Men's Restroom	1	C	Cabinet	Drywall	Intact	White	0.7	Negative	N/A	0.0
59	Men's Restroom	1	B	Toilet	Porcelain	Intact	White	0.7	Negative	N/A	0.0
60	Men's Restroom	1	B	Sink	Porcelain	Intact	White	0.7	Negative	N/A	0.0
61	Women's Restroom	1	D	Wall	Ceramic	Intact	White	0.7	Negative	N/A	0.0
62	Women's Restroom	1	D	Wall	Ceramic	Intact	Black	0.7	Positive	N/A	0.0
63	Women's Restroom	1	A	Cabinet	Drywall	Intact	White	0.7	Negative	N/A	0.0
64	Women's Restroom	1	D	Toilet	Porcelain	Intact	White	0.7	Negative	N/A	0.0
65	Women's Restroom	1	D	Sink	Porcelain	Intact	White	0.7	Negative	N/A	0.0
66	Office 3	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
67	Office 3	1	B	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
68	Office 3	1	A	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
69	Office 3	1	A	Window frame	Metal	Intact	White	0.7	Negative	N/A	0.0
70	Storage Room	1	B	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
71	Storage Room	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
72	Storage Room	1	B	Covebase	Vinyl	Intact	Grey	0.7	Negative	N/A	0.0
73	Storage Room	1	B	Window frame	Metal	Intact	Black	0.7	Negative	N/A	0.0
74	Office 4	1	B	Wall	Wood	Intact	Yellow	0.7	Negative	N/A	0.0
75	Office 4	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
76	Office 4	1	B	Door	Wood	Intact	White	0.7	Negative	N/A	0.0
77	Office 4	1	B	Door frame	Wood	Intact	White	0.7	Negative	N/A	0.1
78	Office 4	1	A	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
79	Office 7	1	B	Door	Wood	Intact	White	0.7	Negative	N/A	0.0
80	Office 7	1	B	Door frame	Wood	Intact	White	0.7	Negative	N/A	0.0
81	Office 7	1	B	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
82	Office 7	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
83	Office 7	1	C	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
84	Office 8	1	B	Door	Wood	Intact	White	0.7	Negative	N/A	0.0
85	Office 8	1	B	Door frame	Wood	Intact	White	0.7	Negative	N/A	0.0
86	Office 8	1	B	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
87	Office 8	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
88	Office 8	1	C	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
89	Office 9	1	D	Door	Wood	Intact	White	0.7	Negative	N/A	0.0
90	Office 9	1	D	Door frame	Wood	Intact	White	0.7	Negative	N/A	0.0

XRF Readings Summary

Reading No.	Room	Floor	Side	Component	Substrate	Condition	Color	Action Level (mg/cm ²)	Results	Approximate Quantity	Lead Reading (mg/cm ²)
91	Office 9	1	B	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
92	Office 9	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
93	Office 9	1	C	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
94	Office 6	1	D	Door	Wood	Intact	White	0.7	Negative	N/A	0.0
95	Office 6	1	D	Door frame	Wood	Intact	White	0.7	Negative	N/A	0.0
96	Office 6	1	C	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
97	Office 6	1	A	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.1
98	Office 6	1	C	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
99	Office 6	1	B	Window frame	Metal	Intact	Black	0.7	Negative	N/A	0.0
103	Restroom 2	1	A	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
104	Restroom 2	1	C	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
105	Restroom 2	1	A	Toilet	Porcelain	Intact	White	0.7	Negative	N/A	0.0
106	Restroom 2	1	C	Sink	Porcelain	Intact	White	0.7	Negative	N/A	0.0
107	Office 5	1	C	Door	Metal	Intact	Black	0.7	Negative	N/A	0.0
108	Office 5	1	C	Door frame	Metal	Intact	Black	0.7	Negative	N/A	0.0
109	Office 5	1	C	Wall	Drywall	Intact	Yellow	0.7	Negative	N/A	0.0
110	Office 5	1	D	Wall	Drywall	Intact	White	0.7	Negative	N/A	0.0
111	Office 5	1	A	Covebase	Vinyl	Intact	Gray	0.7	Negative	N/A	0.0
112	Office 5	1	C	Window frame	Metal	Intact	White	0.7	Negative	N/A	0.0
113				Standard Calibration Check 1.04 +/- 0.06 mg/cm²				1.0	Positive	N/A	1.0
114	End			Standard Calibration Check 1.04 +/- 0.06 mg/cm²				1.0	Positive	N/A	1.1
115				Standard Calibration Check 1.04 +/- 0.06 mg/cm²				1.0	Positive	N/A	1.0

Notes:

mg/cm² - milligrams per cubic centimeter

No. - number

N/A - not applicable

XRF - X-Ray fluorescence



475 Goddard, Suite 200 | Irvine, California 92618 | p. 949.753.7070

ARIZONA | CALIFORNIA | COLORADO | NEVADA | TEXAS | UTAH

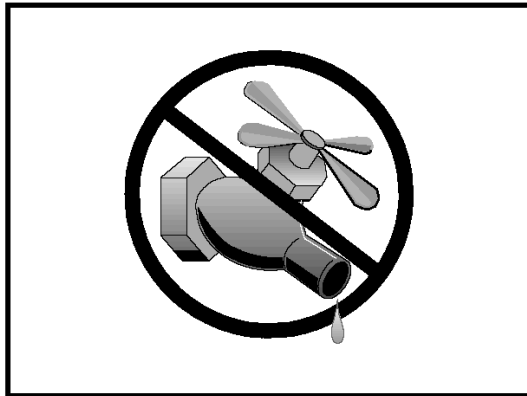
ninyoandmoore.com

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

DIVISION G
BEST MANAGEMENT
PRACTICES

Water Conservation Practices

NS-1



Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

Objectives

EC	Erosion Control	✓
SE	Sediment Control	✓
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	✓
WM	Waste Management and Materials Pollution Control	

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



NS-1

Water Conservation Practices

- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

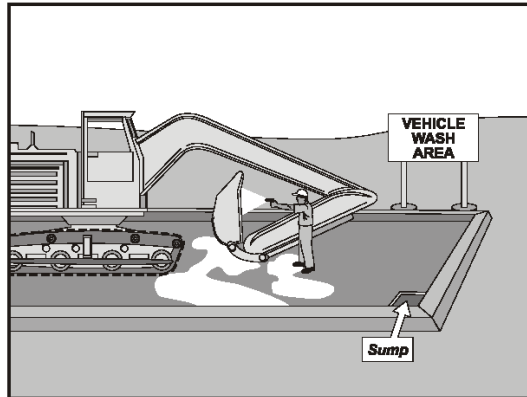
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occurring.
- Repair water equipment as needed to prevent unintended discharges.
 - Water trucks
 - Water reservoirs (water buffalos)
 - Irrigation systems
 - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Vehicle and Equipment Cleaning NS-8



Description and Purpose

Vehicle and equipment cleaning procedures and practices prevent or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning by using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

Use an offsite commercial washing business as much as possible. These businesses are better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	✓
WM	Waste Management and Materials Pollution Control	

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	
Bacteria	✓
Oil and Grease	✓
Organics	✓

Potential Alternatives

None



NS-8 Vehicle and Equipment Cleaning

- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
 - Located away from storm drain inlets, drainage facilities, or watercourses
 - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runoff and runoff
 - Configured with a sump to allow collection and disposal of wash water
 - No discharge of wash waters to storm drains or watercourses
 - Used only when necessary
- When cleaning vehicles and equipment with water:
 - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
 - Use positive shutoff valve to minimize water usage
 - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and should not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

Vehicle and Equipment Cleaning NS-8

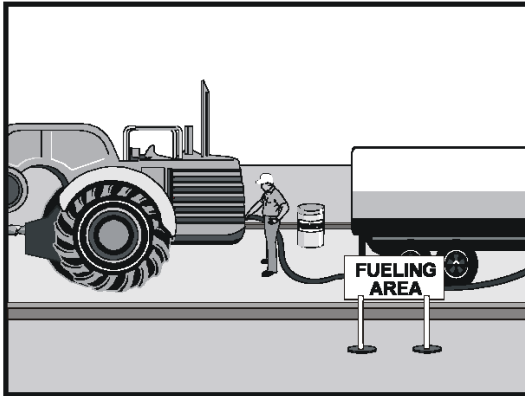
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	✓
WM	Waste Management and Materials Pollution Control	

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	✓
Organics	

Potential Alternatives

None



NS-9 Vehicle and Equipment Fueling

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runoff and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runoff, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

Vehicle and Equipment Fueling **NS-9**

References

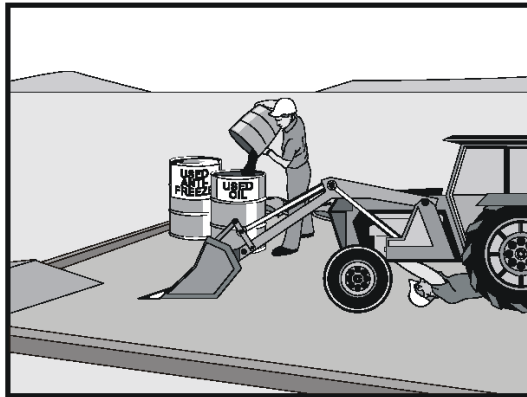
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	✓
WM	Waste Management and Materials Pollution Control	

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	✓
Trash	✓
Metals	
Bacteria	
Oil and Grease	✓
Organics	✓

Potential Alternatives

None

NS-10 Vehicle & Equipment Maintenance

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runoff and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the adsorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.
- Repair leaks of fluids and oil immediately.

Vehicle & Equipment Maintenance NS-10

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an “environmentally friendly” label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The “chlor” term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like, trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

NS-10 Vehicle & Equipment Maintenance

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

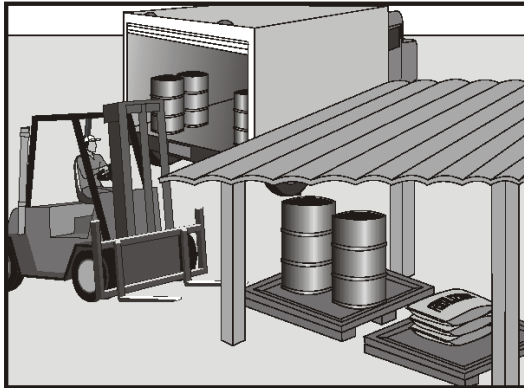
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Material Delivery and Storage WM-1



Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Potential Alternatives

None



WM-1 Material Delivery and Storage

- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Temporary storage area should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be supplied for all materials stored.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located near the construction entrances, away from waterways, if possible.
 - Avoid transport near drainage paths or waterways.
 - Surround with earth berms. See EC-9, Earth Dikes and Drainage Swales.
 - Place in an area which will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.
- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.

Material Delivery and Storage WM-1

- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Chemicals should be kept in their original labeled containers.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, each temporary containment facility should be covered during non-working days, prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

WM-1 Material Delivery and Storage

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep an ample supply of spill cleanup materials near the storage area.
- Keep storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

Material Delivery and Storage **WM-1**

References

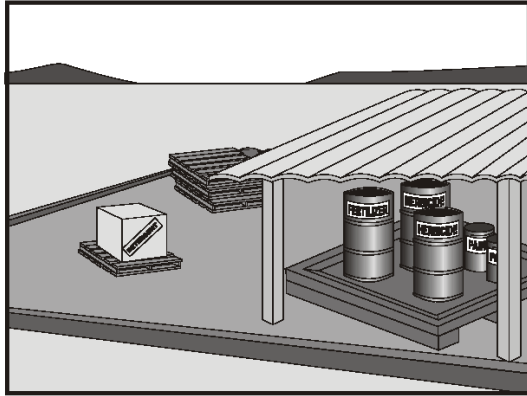
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Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use



Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

WM-2

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Potential Alternatives

None



WM-2

Material Use

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydro seeding. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

Material Use

WM-2

- Require contractors to complete the “Report of Chemical Spray Forms” when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Maintenance of this best management practice is minimal.
- Spot check employees and subcontractors throughout the job to ensure appropriate practices are being employed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

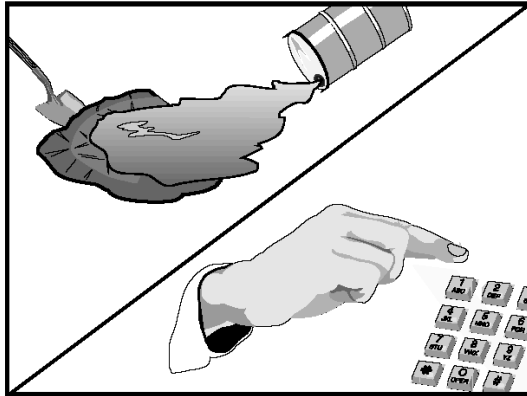
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Spill Prevention and Control

WM-4



Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Potential Alternatives

None



Spill Prevention and Control

WM-4

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runoff during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

Spill Prevention and Control **WM-4**

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
 - Contain the spread of the spill.
 - Recover spilled materials.
 - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Spill Prevention and Control **WM-4**

- Spills should be cleaned up immediately:
 - Contain spread of the spill.
 - Notify the project foreman immediately.
 - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
 - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
 - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
 - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
 - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
 - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
 - Notification should first be made by telephone and followed up with a written report.
 - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
 - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Spill Prevention and Control

WM-4

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

Spill Prevention and Control

WM-4

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

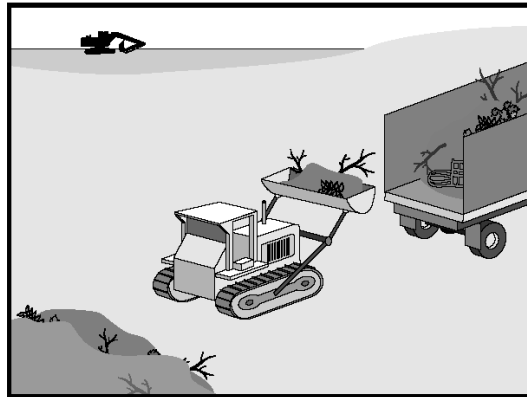
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Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management

WM-5



Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Potential Alternatives

None



WM-5

Solid Waste Management

- Highway planting wastes, including vegetative material, plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

Solid Waste Management

WM-5

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runoff should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

WM-5

Solid Waste Management

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

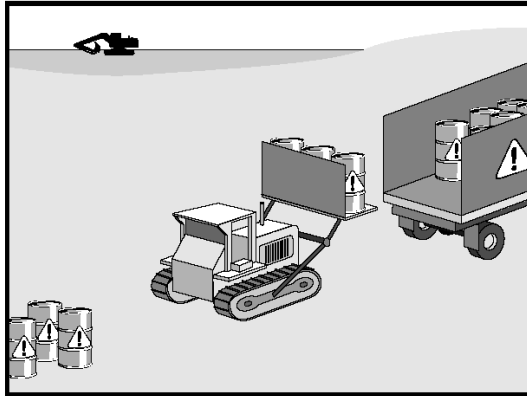
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Hazardous Waste Management WM-6



Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Potential Alternatives

None



Hazardous Waste Management WM-6

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
 - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
 - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
 - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
 - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

Hazardous Waste Management WM-6

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.
- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
 - Ensure that adequate hazardous waste storage volume is available.
 - Ensure that hazardous waste collection containers are conveniently located.
 - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
 - Minimize production or generation of hazardous materials and hazardous waste on the job site.
 - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
 - Segregate potentially hazardous waste from non-hazardous construction site debris.
 - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

Hazardous Waste Management WM-6

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Hazardous Waste Management WM-6

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

Hazardous Waste Management WM-6

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

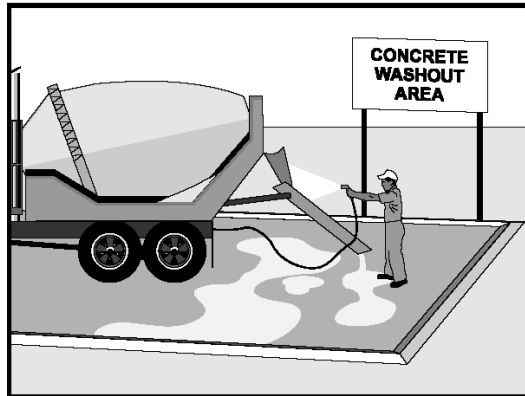
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Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management WM-8



Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout offsite, performing onsite washout in a designated area, and training employee and subcontractors.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities
- Slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition
- Concrete trucks and other concrete-coated equipment are washed onsite
- Mortar-mixing stations exist
- See also NS-8, Vehicle and Equipment Cleaning

Limitations

- Offsite washout of concrete wastes may not always be possible.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	✓

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	✓
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



WM-8 Concrete Waste Management

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
 - Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
 - Store dry and wet materials under cover, away from drainage areas.
 - Avoid mixing excess amounts of fresh concrete.
 - Perform washout of concrete trucks offsite or in designated areas only.
 - Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
 - Do not allow excess concrete to be dumped onsite, except in designated areas.
 - For onsite washout:
 - Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
 - Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
 - Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.
 - Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- ### Education
- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
 - Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- ### Concrete Slurry Wastes
- PCC and AC waste should not be allowed to enter storm drains or watercourses.
 - PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility.
 - A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

Concrete Waste Management WM-8

- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut PCC slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Slurry residue should be vacuumed and disposed in a temporary pit (as described in OnSite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
 - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and

WM-8 Concrete Waste Management

- minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Straw bales, wood stakes, and sandbag materials should conform to the provisions in SE-9, Straw Bale Barrier.
- Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Temporary Concrete Washout Facility (Type Below Grade)
 - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
 - Lath and flagging should be commercial type.
 - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of.
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

Concrete Waste Management WM-8

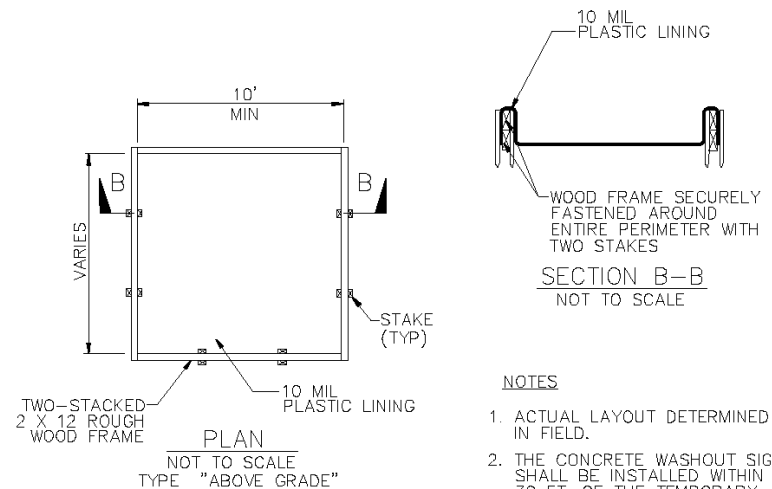
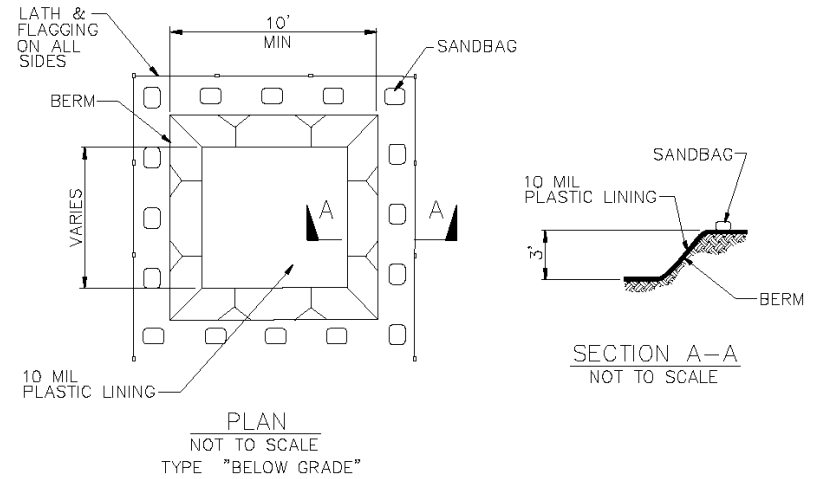
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

WM-8 Concrete Waste Management

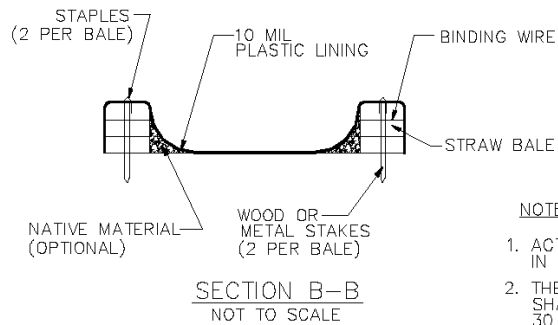
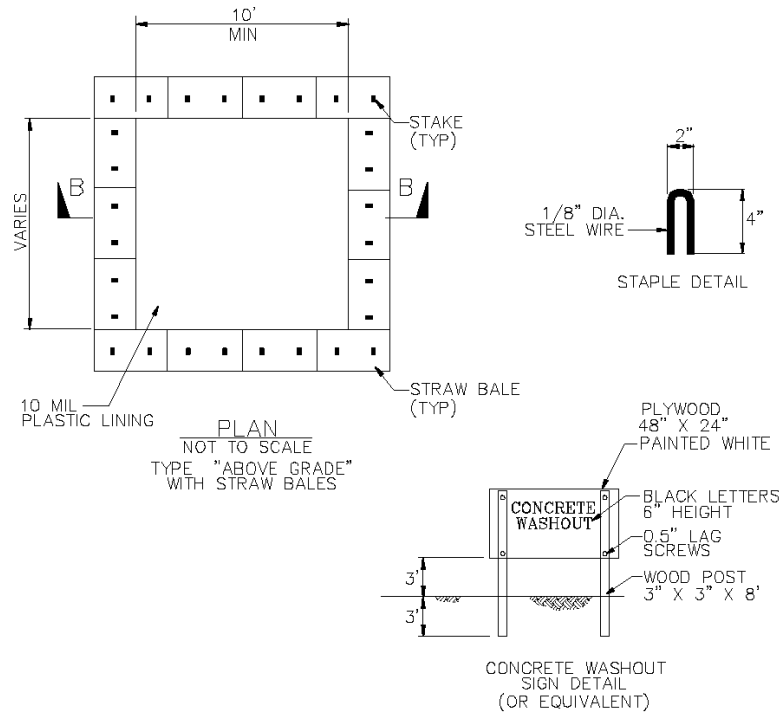


NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Concrete Waste Management

WM-8

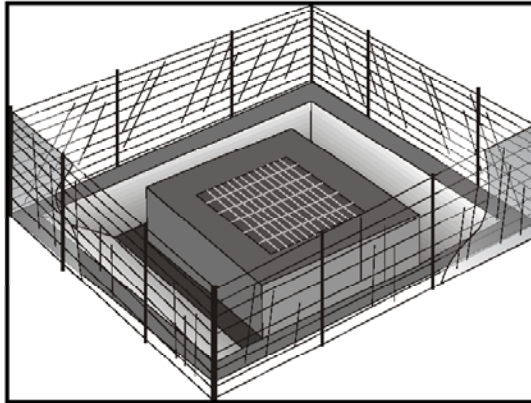


NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Storm Drain Inlet Protection

SE-10



Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

Suitable Applications

Every storm drain inlet receiving sediment-laden runoff should be protected.

Limitations

- Drainage area should not exceed 1 acre.
- Straw bales, while potentially effective, have not produced in practice satisfactory results, primarily due to improper installation.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are

Objectives

EC	Erosion Control	
SE	Sediment Control	✓
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ✓ Primary Objective
- ✓ Secondary Objective

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-9 Straw Bale Barrier



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Storm Drain Inlet Protection

expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should be approved by the local stormwater management agency.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2, Sediment Basin, or SE-3, Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
 - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
 - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the

Storm Drain Inlet Protection SE-10

inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Four types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
 - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
 - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
 - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
 - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- **DI Protection Type 1 - Filter Fabric Fence** - The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
 1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
 2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes must be at least 48 in.
 3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
 4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.
 5. Backfill the trench with gravel or compacted earth all the way around.
- **DI Protection Type 2 - Excavated Drop Inlet Sediment Trap** - The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in

SE-10 Storm Drain Inlet Protection

accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd³/acre of drainage area.

- **DI Protection Type 3 - Gravel bag** - The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability.
 1. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75 in. rock or 0.25 in. pea gravel.
 2. Construct on gently sloping street.
 3. Leave room upstream of barrier for water to pond and sediment to settle.
 4. Place several layers of sand bags – overlapping the bags and packing them tightly together.
 5. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
- **DI Protection Type 4 - Block and Gravel Filter** - The block and gravel filter (Type 4) is shown in the figures. Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.
 1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
 2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
 3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
 4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Costs

- Average annual cost for installation and maintenance (one year useful life) is \$200 per inlet.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

Storm Drain Inlet Protection

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- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- Gravel Filters. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove storm drain inlet protection once the drainage area is stabilized.
 - Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

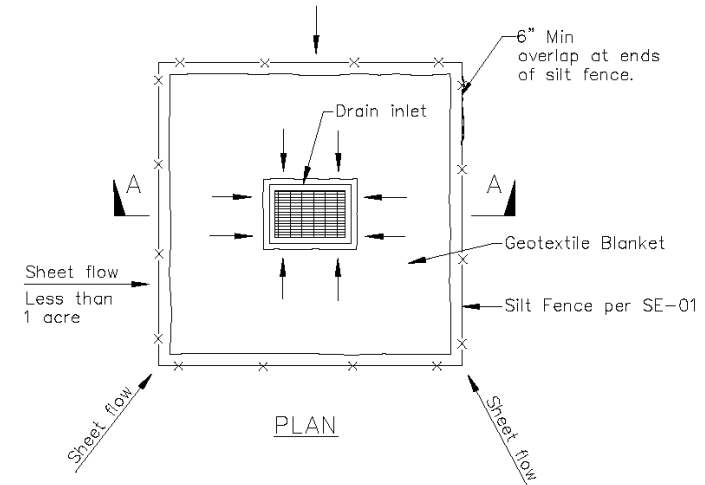
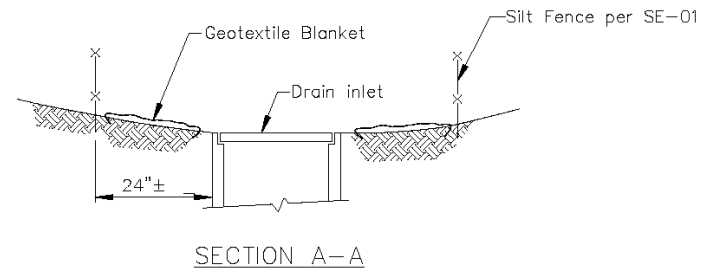
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

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Storm Drain Inlet Protection



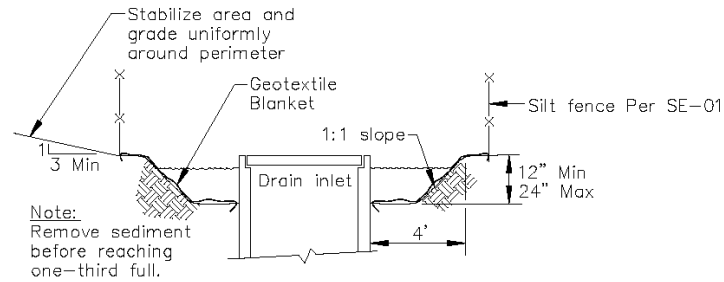
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

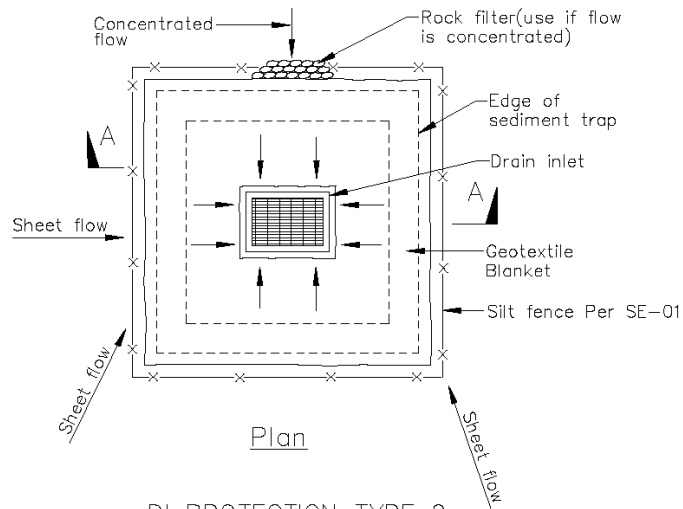
1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

Storm Drain Inlet Protection

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Section A-A



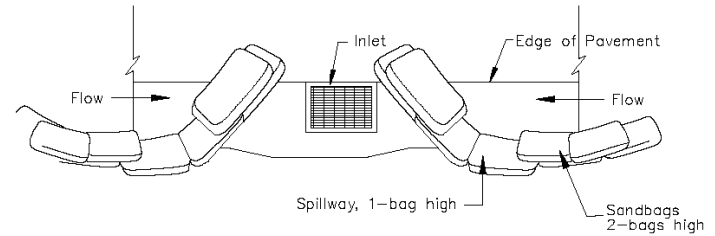
DI PROTECTION TYPE 2
NOT TO SCALE

Notes

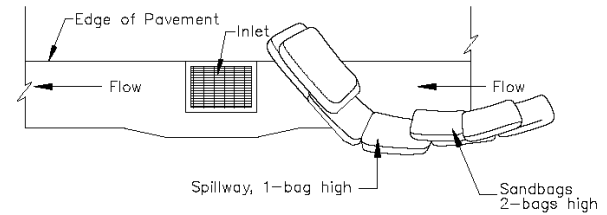
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.

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Storm Drain Inlet Protection



TYPICAL PROTECTION FOR INLET ON SUMP



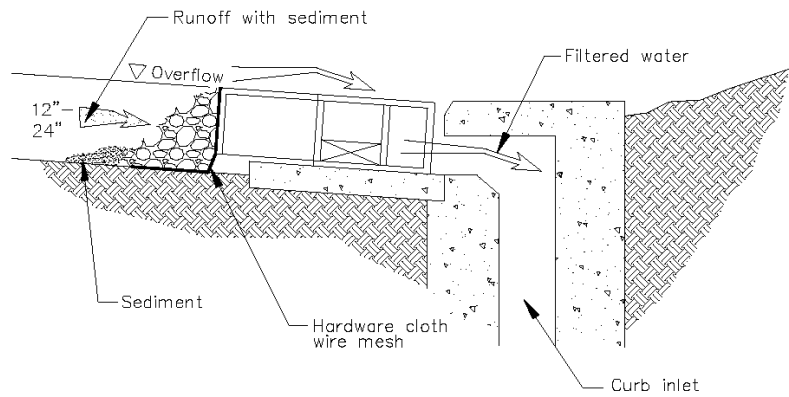
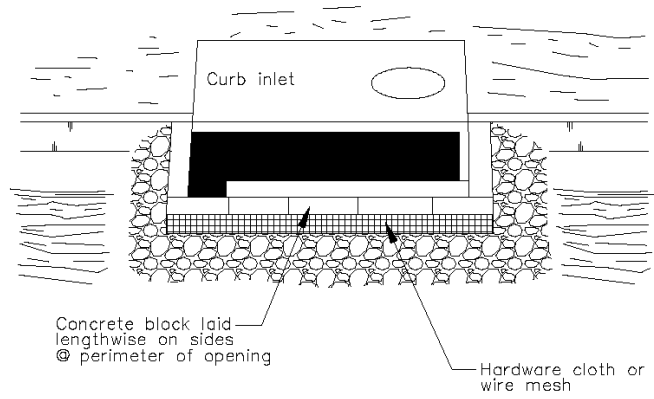
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3
NOT TO SCALE

Storm Drain Inlet Protection **SE-10**



DI PROTECTION — TYPE 4
NOT TO SCALE

DIVISION H
GENERAL
REQUIREMENTS

**DIVISION H
GENERAL REQUIREMENTS**

STANDARD SPECIFICATIONS

These provisions are modifications of the Standard Specifications for Public Works Construction, 2015 Edition, called the Standard Specifications. The Standard Specifications are a part of the Work's Specifications.

The Standard Specifications are written and promulgated by Public Works Standards, Incorporated. Copies of the Standard Specifications are available from the publisher, Building News, Incorporated, 1612 South Clementine Street, Anaheim, California 92802, telephone (714) 517-0970.

PART 1

GENERAL PROVISIONS

SECTION 1 – TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

1-2 TERMS AND DEFINITIONS.

Replace the following definitions:

Agency – See “City.”

Board – The City Council of the City of Long Beach, California, or its designated agencies and boards.

Engineer – The City Engineer of the City of Long Beach, California, and his designated representatives.

Plans – The Plans for this Work consist of Long Beach Project Number 3005010108, (Drawing No. B-4797 and Specification No. R-7206) on file at the Department of Public Works. A copy is included with the Specifications.

Standard Plans – The City’s Standard Plans published by the Department of Public Works. The version of each standard plan to be used shall be the most recent version available at the time of Bid opening.

Calendar Day – Calendar days, is the total number of days that are counted on a calendar, including weekends and holidays, without excluding any non-working days. Therefore, the total number of Calendar days specified for a project is the overall duration of a construction project from its start date to its completion date, including all weekends and holidays, within the specified construction duration.

Add the following definitions:

City – The City of Long Beach, California, its Boards and Commissions, and their officials, employees, and agents.

Major Bid Item – A single Contract item constituting 10% or more of the original Contract Price.

1-3 ABBREVIATIONS.

1-3.2 Common Usage. *Add the following:*

<u>Abbreviation</u>	<u>Word or Words</u>
AB	Anchor bolt
AC	Asphalt concrete, advisory circular
Ave	Avenue
BCR	Begin Curb Return
BD	Bottom of Driveway
Bldg	Building
Blvd	Boulevard
BM	Benchmark
BMP	Best Management Practice
BW	Back of Walk
C	Conduit
CB	Catch Basin
CLB, COLB	City of Long Beach
C&G	Curb and Gutter
CMP	Corrugated metal pipe
CW	Cold water
D	Curvature Degree
D.F.	Drinking fountain
D/F	Double faced
DWY	Driveway
ECR	End Curb Return
Elec	Electrical
Elev	Elevation
E.P.	Each plant
E/S	East Side
Ex, Exist	Existing
(F)	Denotes "Final Pay Quantity" in the Bid
FH	Fire Hydrant
FL	Flow Line
FS	Finished Surface
GB	Greenbook, Grade Break
HW	Hot water
L	Length
Lav	Lavatory
LB	Long Beach
LD	Local Depression
L&I	Landscape and irrigation
LP	Light Pole
Ltg	Lighting
m	Meter
mm	Millimeter
m ²	Square meter
m ³	Cubic meter
Mfr	Manufacturer
MH	Manhole

<u>Abbreviation</u>	<u>Word or Words</u>
MLLW	Mean lower low water (survey datum)
Mon	Monument
MSL	Mean sea level
N	North
No.	Number
N/S	North Side
NS-n, SE-n, or WM-n	Best Management Practice description from the California Stormwater Quality Association BMP Handbook. The letter "n" denotes the description number.
NTS	Not to Scale
PB	Pull Box
PP	Power Pole
PVMT	Pavement
QA/QC	Quality assurance / quality control
QC	Quick coupler
R	Radius
Rd	Road
Rwy	Runway
R/W	Right of Way
S	South
(S)	Denotes "Specialty Item" in the Bid
S/S	South Side
Sch	Schedule
SF	Square foot
S/F	Single faced
SL	Street Light
SNB	Select natural base
S/S	South Side
ST	Street
STA	Station
Std	Standard
SW	Sidewalk
TD	Top of Driveway
T	Tangent
TC	Top of Curb
Tonne	Metric ton, equals 1,000 kilograms
Typ	Typical
Twy	Taxiway
UON	Unless otherwise noted
W	Width / West
WC	Water closet
WH	Weep Hole
W/S	West Side
WV	Water Valve
WWM	Welded wire mesh

Abbreviation Word or Words

1-4 UNITS OF MEASURE.

1-4.1 General, U.S. Standard Measures. *Add the following:*

The Contractor shall use U.S. Standard Measures for construction unless otherwise noted in the specifications for the Work.

SECTION 2 – SCOPE AND CONTROL OF THE WORK

2-3 SUBCONTRACTS.

2-3.1 General. *Add the following:*

To the extent that Subsection 2-3.1 is inconsistent with Long Beach Municipal Code Sections 2.87.010 through 2.87.080, the Long Beach Municipal Code supersedes Subsection 2-3.1.

2-3.2 Self-Performance Replace this subsection with the following:

Standard requirements apply unless changed herein.

The Contractor shall perform, with its own organization, Contractor work amounting to at least 10 percent of the Contract Price except that any designated “Specialty Items” maybe be performed by subcontract and the amount of any such “Specialty Items” so performed will be deducted from the Contract Price before computing the amount required to be performed by the Contractor with its own organization. “Specialty Items” will be identified by the Agency in the Bid or in the Special Provisions. Where an entire item is subcontracted, the value of work subcontracted will be based on the Contract Unit Price. When a portion of an item is subcontracted, the value of work subcontracted will be based on the estimated percentage of the Contract Unit Price. This will be determined from information submitted by the Contractor, and subject to approval by the Engineer.

2-4 CONTRACT BONDS. *Add the following:*

Sureties that are not listed in the latest revision of the United States Department of the Treasury Circular 570 shall nevertheless be admitted to issue bonds in the State of California.

2-5 PLANS AND SPECIFICATIONS.

2-5.3 Submittals. *Supplement Table 2-5.3.2(A), untitled, and the listing shown in Subsection 2-5.3.4, “Supporting Information,” with the following combined table:*

TABLE 2-5.3(A), Submittals

Item	Section Number	Title	Subject
18	2-5.4	Record Drawings	Record Drawings
19	2-9	Surveying	Survey Records
20	4-1.4	Test of Materials	List of Materials
21	4-1.5	Certification	Certifications for all materials used on the project.
22	6-1	Construction Schedule and Commencement of Work	Construction Schedule
23	6-8 and various technical sections	Completion, Acceptance, and Warranty	Special Warranties
24	7-2.2	Labor	Labor Compliance documentation
25	7-3 and 7-4	Liability and Workers' Compensation Insurance	Insurance documentation
26	7-5	Permits	Permits
27	7-9	Protection and Restoration of Existing Improvements	Certifications & Warranty Documents.
28	9-2	Lump Sum Work	Lump Sum Details- breakdown into detailed schedule of values
29	201-1.1	Requirements	Concrete Mix Designs
31	600-1.1	Public Convenience and Safety	Traffic Control Plan
32	Various	Catalog Details / Manufacturer's Specifications	For all component products that will form part of the installation on this project.
33	Various	Shop Drawings	For HVAC, Electrical and Plumbing Systems, Fire Sprinklers and Fire Alarm Systems, Solar System, Traffic Signal System
36	Various	Instruction Manuals / Control Charts	For the new construction and on site and off site improvements

This table is not comprehensive: additional submittal items may be listed in other sections of the Specifications.

2-5.3.1 General. *Add the following:*

Deliver submittals to the City's Project Management Software (Information will be provided in Division E).

Project Title: Fire Station 9

The Contractor shall not begin Work until the Engineer has approved relevant submittals in writing. The City will not make final payment before the Contractor delivers all required Work submittals.

Add the following subsection:

2-5.4 Record Drawings.

The Contractor shall keep one complete set of the Plans, reserved for use as record drawings, at the Work site at all times. The Contractor shall maintain on these drawings a currently updated record of all construction changes and variations from the Plans, including all underground and surface improvements installed in locations other than those indicated on the Plans. The Contractor shall enter the record information in red. Where a Plan does not exist, the Contractor shall submit an accurate and detailed sketch. The Contractor shall properly dimension and locate all changes and variations to the Plans.

The Contractor shall submit the record drawings to the Engineer prior to final acceptance of the Work.

2-9 SURVEYING.

2-9.1 Permanent Survey Markers.

Replace this subsection with the following:

The Contractor shall be responsible for the preservation and perpetuation of all existing monuments which control subdivisions, tracts, boundaries or rights-of-way, or which provide survey control, including benchmarks, which will be disturbed by the Contractor's activities.

After receiving the Notice to Proceed, the Contractor, using the services of a surveyor licensed in California, shall submit to the City preliminary Corner Records for those monuments that were found in the area of construction. The Contractor will not be given authorization for any removals until the City's Surveyor has accepted and approved the preliminary Corner Records.

Prior to removals, the Contractor shall request the City of Long Beach Surveyor to transfer to temporary bench marks the elevation for any bench marks to be reset, and provide a brass disc for the City Surveyor to stamp. When the discs are stamped and returned to the Contractor, the Contractor shall construct the bench marks at locations marked out by the City Surveyor.

The Contractor's surveyor shall set new ties for any monuments whose ties are disturbed, and prepare preliminary Corner Records for the new ties.

After construction and before final payment, the Contractor's surveyor shall submit to the City for its review the preliminary Corner Records for any monuments replaced or constructed, or whose ties are reset. The City will not approve preliminary Corner Records showing "No Reference" unless the Contractor can demonstrate that a diligent effort was made to find a reference. After the City's approval, the Contractor's surveyor shall file Corner Records for those monuments in the Office of the County Surveyor and

shall provide the City with a copy of all Corner Records filed.

Payment for monument preservation and perpetuation by the Contractor shall be considered as included in the prices bid for the various items of Work, and the City will make no additional payment therefor.

2-9.2 Survey Service.

Replace this subsection with the following:

The Contractor shall set and maintain all stakes and marks necessary for the construction of the Work and perform any additional design surveys that may be required. Except for the survey control data provided on the plans, all calculations, surveying and measures required for setting and maintaining the necessary lines and grades shall be performed by the Contractor.

Surveys performed by the Contractor shall conform to the California Land Surveyor's Act. In accordance with the Act, "responsible charge" for surveying shall reside with a licensed land surveyor or a civil engineer qualified to practice land surveying in California.

The minimum standard of survey quality shall be that of similar surveys performed by the City of Long Beach.

The Contractor shall provide to the Engineer copies of all calculations, survey notes, and staking data when requested by the Engineer. The Engineer shall decide all questions which may arise as to the quality or acceptability of deliverables furnished and surveying performed for this Work, and the Engineer's decision shall be final.

The Contractor shall verify layout information shown on the Plans before proceeding with layout of construction features.

The Contractor shall record deviations from the required lines and levels and shall advise the Engineer promptly upon detecting deviations exceeding indicated or recognized tolerances. Record deviations which are accepted (not corrected) shall be shown on the as-built record drawings. Before final acceptance of the Work, the Contractor shall provide to the Engineer all computations, survey notes, and other survey data used to accomplish the Work, which shall become the property of the City. Construction stakes shall be removed from the Work when no longer needed.

Payment for surveying by the Contractor shall be considered as included in the prices bid for the various items of Work, and the City will make no additional payment therefor.

2-10 AUTHORITY OF BOARD AND ENGINEER. *Add the following:*

The Engineer will interpret the meaning of the Plans and Specifications, and the Engineer's decision will be final.

If there appears to be any error or discrepancy in or between the Plans and Specifications, the Contractor shall refer the matter to the Engineer for adjustment before proceeding with the Work. If the Contractor proceeds with the Work without referring the matter, the Contractor does so at its own risk and must bear any additional cost incurred as a result of failure to refer.

SECTION 3 – CHANGES IN WORK

3-2 CHANGES INITIATED BY THE AGENCY.

3-2.2 Contract Unit Prices.

3-2.2.1 General. *Replace this subsection with the following:*

If the Engineer orders a change in quantity of an item of Work, and the change does not involve a substantial change in character of the Work from that shown in the Plans or Specifications, the City will adjust the total payment to be made for the item of Work by multiplying the amount authorized and installed by the Contract Unit Price. This amount may be greater or less than the amount shown in the Bid.

If the total quantity of a Major Bid Item is changed, only changes within 25% of the quantity shown in the Bid, either more or less, will be adjusted at the Contract Unit Price. If the total quantity of a Major Bid Item is changed in excess of 25%, the adjustment in payment will be made per 3-2.4. The adjustment in payment will be made only for the quantity of the Major Bid Item that exceeds 25%, either increase or decrease.

3-2.2.2 Increases of More Than 25%. *Replace this subsection with the following:*

If the total quantity of a Major Bid Item is increased in excess of 25% more than the quantity shown in the Bid, and if the City and the Contractor cannot agree upon an adjustment in Contract Unit Price, the Work shall proceed according to 3-3, and as follows:

The costs determined for the item of Work shall not include fixed costs. Fixed costs shall be deemed to have been recovered by the Contractor through payment for 125% of the Bid quantity at the Contract Unit Price.

3-2.2.3 Decreases of More Than 25%. *Replace this subsection with the following:*

If the total quantity of a Major Bid Item is decreased in excess of 25% less than the quantity shown in the Bid, no adjustment in the Contract Unit Price will be made unless so requested in writing by the Contractor. If the Contractor so requests, the adjustment in payment will be made per 3-2.4. If no adjustment in Contract Unit Price can be agreed upon by the City and the Contractor, the Work shall proceed according to 3-3, and as follows:

In no case will payment be less than would be made for the actual quantity at the Contract Unit Price, nor more than would be made for 75% of the Bid quantity at the Contract Unit Price.

3-3 EXTRA WORK.

3-3.2 Payment.

3-3.2.3 Markup.

3-3.2.3.1 Work by Contractor. *Replace this subsection with the following:*

The allowance for overhead and profit on all labor, materials, equipment and other contractor costs shall not exceed 10%. This 10% is inclusive of any costs associated with bond premiums or other contractor expenses.

3-3.2.3.2 Work by Subcontractor. *Replace this subsection with the following:*

When a subcontractor performs all or any part of the extra work, the markups in 3-3.2.3.1 shall be added to the subcontractor's actual cost of such work. The Contractor may add an additional markup of 5% of the subcontracted portion of work.

SECTION 4 – CONTROL OF MATERIALS

4-1 MATERIALS AND WORKMANSHIP

4-1.2 Protection of Work and Materials. *Add the following:*

The Contractor shall remove and replace materials damaged by the Contractor's operations at the Contractor's sole expense before the final inspection and acceptance.

4-1.4 Test of Materials. *Add the following:*

The Contractor shall submit samples of materials, at the Contractor's sole expense, as the Engineer may require, 15 days in advance of being incorporated in the Work to a testing laboratory designated by the City.

Samples of materials to be tested shall be properly identified and shall establish exact nature and character of materials. The City may reject any material or part thereof that proves defective as a result of testing and requires satisfactory replacement.

4-1.6 Trade Names or Equals. *Add the following:*

Where a specific manufacturer is noted on the Plans or listed in the Specifications, unless otherwise noted, an "approved equal" item may be substituted.

If a Bidder desires to bid an "approved equal" item, the Bidder shall submit a request to do so to the Engineer in writing by the time and as shown in the Instructions to Bidders.

SECTION 5 – UTILITIES

5-1 LOCATION. *Add the following:*

The City has determined the locations of all known existing subsurface facilities from records and field investigations and these facilities are shown on substructure drawings, which are available for review in the Department of Public Works. However, the City does not guarantee the accuracy of the indicated locations or that all facilities are

shown.

The Contractor shall request Underground Service Alert and conduct potholing at least two weeks prior to any other excavation. Any discrepancies between field conditions and the Plans and Specifications shall be submitted to the Engineer in writing for review.

The City may arrange for and conduct a preconstruction meeting between the Contractor, the Engineer, and the utility owners to discuss scheduling, coordination of any required utility relocations, and the protections of existing utilities. The Contractor shall attend any preconstruction meeting scheduled by the Agency and shall cooperate with all utility owners performing utility markings, relocation or installation work of the Project site.

5-3 REMOVALS. *Add the following:*

The Contractor shall remove interferences shown on the Plans, other than utilities, to clear construction by at least 12 inches.

5-4 RELOCATION. *Add the following:*

The Contractor shall perform work on utilities only when authorized by the utility's owner and only using the services of firms pre-qualified by the owner.

Add the following subsection:

5-4.1 Resetting Vaults and Other Appurtenances.

Certain manholes, vaults, valve boxes or other appurtenances belonging to utility companies or others may need resetting to grade. The City does not guarantee that all such items are shown on the Plans. The Contractor is not required to do the work of resetting such to grade, except sewer and storm drain manholes, Long Beach Utilities Department, (previously Long Beach Gas & Oil Department and Long Beach Water Department), valve boxes and meter boxes, and City-owned communications vaults; however, the Contractor shall notify the owners at least one week in advance of construction to give them opportunity to perform the necessary work in conjunction with Work performed by the Contractor.

Add the following section:

5-7 UNKNOWN FACILITIES.

If the Contractor encounters any unknown facility, or if any known facility's actual location is greatly different than the Plans indicate, the Contractor shall immediately notify the Engineer and not disturb the facility except in the presence of the Engineer.

Add the following section:

5-8 FACILITIES REQUIRING SPECIAL PRECAUTIONS.

The Contractor's attention is directed to the existence of certain underground facilities that may require that Contractor take special precautions to protect the health, safety and welfare of workers and the public. Facilities requiring special precautions include but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines; underground electric supply system conductors or cables either directly buried or in duct or conduit which do not have concentric neutral conductors or other effectively grounded metal shields or sheaths; and

underground electrical conductors with a potential-to-ground of more than 300 volts. The Contractor shall notify the Engineer at least 48 hours before performing any Work in the vicinity of such facilities.

If such facilities are not located on the Plans in both alignment and elevation, the Contractor shall perform no Work in the vicinity of these facilities until the owner, or its representative, has located the facility by potholing, probing, as-built plans or other means that will locate and identify the facility.

5-9 GENERAL REQUIREMENTS WHEN WORKING AROUND LONG BEACH ENERGY RESOURCES (LBER) FACILITIES, (NOW PART OF LONG BEACH UTILITIES DEPARTMENT).

All excavations, whether in the public right of way, or on private property require a valid Dig Alert Ticket from Underground Service Alert of Southern California (USASC). Excavators MUST contact USASC by dialing 811 at least 48 hours prior to any excavation work. LBER, and all other underground facility operators will locate and mark existing substructures at no charge in delineated areas.

The excavator shall immediately contact LBER Inspection upon damaging or exposing any LBER main or service. All active LBER facilities, including gas distribution mains & services, shall be protected in place by the excavator. Wrap damage of LBER mains or services will be repaired by LBER free of charge. Any other damage to LBER's facilities will be repaired by LBER at the excavator's expense. Any repair or relocation work required on LBER's facilities can solely be performed by LBER and will be subject to LBER's availability of resources.

Any exposed, active LBER main or service shall be supported at the excavator's expense with an approved LBER method. Any active LBER main or service exposed for a duration longer than 5 days shall be protected from exposure to sunlight. The support design shall be submitted to LBER Engineering for approval prior to implementation.

A minimum 12" clearance around LBER's facilities shall be maintained by the excavator when installing new pipelines or other structures near LBER facilities. The excavator shall notify LBER Inspection prior to backfilling around any active LBER main or service. The backfill material & method used by the excavator is subject to LBER Inspection's review & approval.

LBER contacts: LBER Engineering/Inspection – (562) 570-2085

LBER 24-Hour Emergency Line – (562) 570-2140

SECTION 6 – PROSECUTION, PROGRESS, AND ACCEPTANCE OF THE WORK

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK.

Replace the entire subsection with the following:

6-1.1 Construction Schedule.

6-1.1.1 Terms and Definitions. The following terms and their respective definitions are in addition to those specified in 1-2.

As-Built Schedule – The final updated Construction Schedule that reflects actual construction progress throughout the entire duration of the Project.

Baseline Schedule – The original Construction Schedule used as the basis for measuring construction progress and Contract performance.

Constraint – A requirement that restricts or dictates the Construction Schedule.

Construction Schedule – The schedule of construction activities that reflects the means and methods, planned sequencing, duration, and Milestone dates for the completion and acceptance of the Work. Types include the Baseline Schedule, Weekly Schedule Update, Monthly Schedule Update, and the As-Built Schedule.

Critical Path – The sequence of activities shown on the Construction Schedule which adds up to the longest overall duration.

Data Date – The latest date through which the activities shown on the Construction Schedule have been updated.

Milestone – A schedule activity that has zero duration and which graphically represents the start or finish of a portion of the Work.

Monthly Schedule Update – An updated Construction Schedule submitted every month that compares actual construction progress versus the progress planned on the Baseline Schedule.

Total Float - the maximum amount of time an activity can be delayed from its early start without delaying the completion of the Work. Float shall be an expiring resource available to both the Contractor and the Agency. Float shall not be for the exclusive use or benefit of either the Agency or the Contractor.

Weekly Schedule Update – An updated Construction Schedule submitted every week that reflects the status of construction activities from the past week and also includes construction activities scheduled in detail for the following 2 weeks.

6-1.1.2 General. Construction schedules shall conform to the following requirements:

- a) The Construction Schedule shall be prepared using the latest version of Primavera "Suretrak", Microsoft "Project Professional", Primavera "Project Planner

(P6)", or Agency-approved equal.

- b) The Construction Schedule shall be prepared using the Critical Path Method (CPM) illustrating the chronological relationship and sequence of work activities. Activities on the Critical Path shall be clearly delineated.
- c) Work activities shall be based on the Bid items listed in the Schedule of Prices in the Bid Proposal and the following:
 - i) Bid Items shall be subdivided into those portions to be constructed during each stage or phase of construction, or portions which do not exceed 20 Working Days, whichever is less.
 - ii) Each activity shall be identified with its corresponding Bid item number(s) or Change Order item number(s) listed in the Engineer's Monthly Estimate.
 - iii) Each submittal, and the corresponding Agency review period, shall be shown as an individual activity.
 - iv) Submittals which must be accepted prior to issuance of the NTP shall be identified.
 - v) The procurement of construction materials and equipment shall be identified and shown as individual activities.
 - vi) Work to be performed by subcontractors shall be identified and shown as individual activities.
 - vii) NTP requirements shall be shown as individual activities.
 - viii) Each submittal of the Equal Employment Opportunity Form per 7-2.6 shall be shown as a separate activity
- d) Start and completion dates of each work activity shall be illustrated.
- e) The Construction Schedule shall commence on the date of issuance of the NTP and end on the date of fulfillment of all of the requirements in the Contract Documents.
- f) Change Orders, including number, description, approval date, and duration shall be shown as individual activities.
- g) The schedule shall reflect the following Constraints:
 - i) Utility relocations per 5-4.
 - ii) Schedule impacts due to the protection, removal, or relocation of utilities per 5-1.

Sequencing and phasing of work shall be clearly outlined to provide for reasonable time to respond to utility marking requests.

- iii) The Sequence of Work per 6-2.3
 - iv) Temporary traffic control requirements per Section TTC of the Special Provisions.
 - v) The Time of Completion per 6-7. A Baseline Schedule submitted showing completion earlier or later than the time of completion specified will not be accepted.
- h) The schedule activities shall include the following information:
- i) Activity ID
 - ii) Bid Item No(s).
 - iii) Activity Name
 - iv) Original Duration
 - v) Actual Duration
 - vi) Start Date
 - vii) Finish Date
 - viii) Actual Start Date
 - ix) Actual Finish Date
 - x) Total Float

6-1.1.3 Submittals.

a) Baseline Schedule.

Within 10 Days of issuance of the NTP, the Contractor shall submit a Baseline Schedule for review and acceptance by the Engineer in accordance with 2-5.3 and 6-1.1.3.

The Baseline Schedule submittal shall include a portable document file (pdf) and a program file, accessible using the latest version of Primavera "Suretrak", Microsoft "Project Professional", Primavera "Project Planner (P6)", or Agency-approved equal. The schedule may be emailed to the Engineer and submitted with

three (3) printed color copies on 11-inch x 17-inch sheets.

- b) Weekly Schedule Updates.** During the weekly on-site management meetings, the Contractor shall submit Weekly Schedule Updates using the same software used to prepare the Baseline Schedule. The schedule updates will be used to manage, coordinate, and schedule all upcoming Contract activities. These detailed schedules may be submitted in bar chart format and shall reflect the logic and sequence used for the accepted Baseline Schedule. The Weekly Schedule Update shall include the following:
- i) Status of the construction activities of the past week, scheduled vs. actual.
 - ii) An explanation for deviations from planned activities, together with actions taken or planned to recover lost time, if applicable.
 - iii) Three-week "look-ahead" Schedule detailing all work activities planned for the next three (3) weeks, including all work to be performed by others. Activities included in the Baseline Schedule shall be further broken down into detailed activities, by specific task, by specific area, at the crew level or lower.
- c) As-Built Schedule.** Within 7 Days after completion of the Work per 6-8.1, the Contractor shall prepare and submit an As-Built Construction Schedule using the same software used to prepare the Baseline Schedule. The Engineer will not submit the final progress payment for processing until the schedule has been submitted. The schedule shall be emailed to the Engineer in addition to three (3) printed color copies on 11-inch x 17-inch sheets.

The As-Built Schedule shall reflect the actual progress of the Work from the date of issuance of the NTP through the date of completion. Should the As-Built Schedule not reflect the actual start and finish dates of all work activities, the schedule will be returned to the Contractor for revision and re-submittal.

The schedule shall be submitted with a written certificate signed by the Contractor's Authorized Representative stating:

"To my knowledge and belief, the enclosed As-Built Schedule reflects the actual start and finish dates of the actual work activities for the Contract contained herein."

6-1.1.4 Payment. Payment for preparation of Schedule shall be considered as included in the prices for the various items of Work, and the City will make no additional payment therefor.

No separate or additional payment will be made for preparation of each Weekly Schedule Update.

6-1.2 Commencement of Work.

Add the following:

The Contractor shall commence work on the date to be specified in a written "Notice to Proceed" from the City and complete all Work within the time stated in Division B. The Contractor shall begin the procurement of materials within 5 working days after approval by the Engineer of shop drawings and submittals relating to equipment and materials. Submittals for long procurement items shall be provided within thirty (30) calendar days from receipt of "Notice to Proceed". Submittals marked "revise and resubmit" shall be revised and resubmitted within ten (10) calendar days from the date of receipt.

The Contractor shall submit a written proposed construction schedule to the Engineer at the preconstruction conference required in Subsection 6-1.3. The Contractor shall submit updated construction schedules weekly.

Add the following subsection:

6-1.3 Preconstruction Conference.

Prior to the commencement of Work and after execution of the Contract, the City will contact the Contractor to participate and make arrangements for a preconstruction conference with all interested parties.

Add the following subsection:

6-1.4 Notices.

The Contractor shall give advance notice, shown below, to the proper office prior to the time each of the following operations is to be commenced.

Operation	Office	Phone	Advance Notice
Start of Work	Inspection Section	(562) 570-5160	2 working days
Shutdown of work or resumption of work after shutdown	Inspection Section	(562) 570-5160	2 working days
Layout & Stakes	Inspection Section	(562) 570-5160	2 working days

Operation	Office	Phone	Advance Notice
Closing of Streets	L.B. Police Department* L.B. Fire Department*	(562) 570-7241 (562) 591-7631	24 hours
Traffic Signals & Loop Dectors	Inspection Section	(562) 570-5160	3 working days
Traffic Striping and Signs	Inspection Section	(562) 570-5160	3 working days
Bus Stops	Long Beach Public Transportation Company	(562) 808-8801	1 week
Closing of Streets	L.B. Police Department L.B. Fire Department	(562) 570-7241 (562) 591-7631	24 hours
Working adjacent to Gas lines	So. Cal Gas	(562) 570-2100	3 working days
Working adjacent to Electrical utilities	SCE	1-800-655-4555	3 working days
Tree Pruning	Inspection Section	(562) 570-5160	2 working days

*Notify the Inspection Section before notifying these offices.

The Contractor shall notify the owners of all utilities at least 48 hours before any excavation or work adjacent to utility structures. The utility companies listed below can be contacted as indicated.

1. Underground Service Alert (USA/SC)
Telephone: 1-800-227-2600
2. City of Long Beach Water Department or USA/SC
(Water, Sewer and Storm Drain Facilities)
Operations Service Center
Telephone: (562) 570-2389 or (562) 570-2390
3. City of Long Beach Gas and Oil Department or USA/SC
Chuck Querido
Telephone: (562) 570-2036
4. Southern California Edison Company or USA/SC
Telephone: 1-800-655-4555
5. Frontier Communications

Neil Aliberti
Telephone: (714) 375-6705

6. City of Long Beach Bureau of Traffic and Transportation
Traffic Signal Coordinator, Operations Division, Street Lights
Daryl Gee
Telephone: (562) 570-3263
7. All other utilities:
City of Long Beach, Bureau of Engineering
Telephone: (562) 570-5160

6-1.5 Weekly Update Meetings.

The Agency will schedule and conduct weekly meetings for the purposes of construction management as well as assessing the status of the informal partnership. The weekly meetings will have a set agenda, including, but not limited to, a report and discussion of the status of the following:

- a) Weekly Detailed Schedule per 6-1.1(d)
- b) 3 Week Look Ahead Schedule
- b) Quality assurance/quality control
- c) BMPs/SWPPP Compliance
- d) Site operations, including coordination of work by others
- e) Community/public relations
- f) Change Orders
- g) Submittals
- h) RFI's

6-2 PROSECUTION OF THE WORK.

Add the following subsection:

6-2.3 Sequence of Work. Add the following:

The Contractor's construction schedule and sequence of work shall conform to the following:

- a) SWPPP – Refer to Section 7-8.6.3
- b) The first order of construction work shall be any construction work specified as such in 6-1.2 or on the Plans.
- c) Safe-off all live utilities prior to the commencement of any demolition work.
- d) Carry out an extensive potholing operation to determine the physical location and the depth of existing underground utilities at the site and at locations for new wet and dry utilities.
- e) Complete the abatement operation for asbestos, mold and lead paint for the existing building on site.
- f) Demolition and removal from the site the existing building, perimeter walls, railings, gates, pavement and landscaping. Protect in place existing trees along the Western boundary of the site.

- g) Installation of all underground wet and dry utilities
- h) Construction of 12,779 SF two story fire station complete in place with photovoltaic system.
- i) Onsite improvements including Irrigation & Landscaping, new concrete flatwork, new perimeter fence and automated sliding gates, EV charging station and all other work delineated in the plans and specifications.
- j) Off-site improvements include widening and reconstruction of a section of the alley, improvements to Randolph Place, remove & replace existing sidewalks, curb and gutter along a section of Long Beach Blvd., new landscaping and all other work delineated in the plans and specifications.
- k) Installation of new traffic signals, loop detectors, and striping at the Long Beach Blvd / Randolph Place intersection.
- l) Traffic and pedestrian control during the construction phase.
- m) Coordinate the undergrounding of the overhead utility lines with SCE and other utility users with overhead utilities.
- n) New electrical service for the project.

6-7 TIME OF COMPLETION. *Add the following subsections*

6-7.4 Additional Requirements. *Add the following*

The Contractor shall perform no Work on days other than Working Days or outside of normal working hours (defined as the hours between 7:00 a.m. to 4:00 p.m.) without the consent of the Engineer, unless otherwise specified. In any event, all Work shall be subject to approval of the Engineer. Before starting such work, the Contractor shall make arrangements with the Engineer for the continuous or periodic inspection of the work and tests of materials, when necessary. If the Contractor requests permission to work outside of the above time periods and if the City grants such request, the Contractor shall pay all extra expense to the City for inspection and other incidental expenses caused by such overtime work. If the City requests the Contractor to work overtime or if overtime work is specifically required by these Specifications, the City will pay all extra expense of inspection.

If the Contractor finds it necessary, in order to complete the work according to schedule, to perform certain of its operations outside of Working Days or normal working hours, these operations shall be performed as part of the Work included in the Contract Price and shall not constitute a basis for additional payments.

6-8 COMPLETION, ACCEPTANCE, AND WARRANTY.

Add the following subsection:

Upon acceptance by the Engineer, the Engineer will file a Notice of Completion with Los Angeles County Recorder. The date the Notice of Completion is filed will be the date of acceptance of the Work and the date the Contractor is relieved from responsibility to protect the Work.

The acceptance of the Work or the payment of any money by the City shall not operate as a waiver of any provision of the Contract, or of any power reserved to the City, or of any right to damages or indemnity provided in the Contract. The waiver of any

breach of the Contract, or any default hereunder, shall not be held to be a waiver of any other or subsequent breach or default.

The Contractor shall guarantee all Work against failure due to defective materials and faulty workmanship for a period of 1 year after the date of acceptance of the Work by the City, unless some longer period is expressly set forth in any manufacturer's warranty or within the Specifications.

When the City discovers defective material or workmanship that requires repair or replacement under guarantee, the Contractor shall furnish all necessary labor, materials, and equipment to correct and make good, at no expense to the City, all such defects. The Contractor shall commence repair or replacement within 24 hours after receiving written notice from the Engineer, and diligently and continuously perform the Work until the repair or replacement is completed and the City has accepted it.

6-9 LIQUIDATED DAMAGES. *Add the following:*

The City will assess liquidated damages at the rate of \$4,530.00 per calendar day that the Contractor exceeds the specified time of completion.

6-11 CLAIMS RESOLUTION. *Add the following subsection:*

6-11.1 Compliance with Mandatory Procedures. Contractor's use of the claims resolution process available in Public Contract Code Section 9204 (as set forth below in Section 6-11.2) shall not satisfy or otherwise excuse Contractor's compliance with the mandatory notice and claim presentation procedures pursuant to Chapter 5 (commencing with Section 930) of Part 3 of Division 3.6 of Title 1 of the California Government Code.

6-11.2 Public Contract Code Section 9204.

Section 9204 is added to the Public Contract Code, to read:

The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a Contractor in connection with a public works project.

For purposes of this section:

1. "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:
 - (a) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

- (b) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.
 - (c) Payment of an amount that is disputed by the public entity.
- 2. “Contractor” means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.
- 3. “Public entity” means, without limitation, except as provided in subparagraph 4. below, a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.
- 4. “Public entity” shall not include the following:
 - (a) The Department of Water Resources as to any project under the jurisdiction of that department.
 - (b) The Department of Transportation as to any project under the jurisdiction of that department.
 - (c) The Department of Parks and Recreation as to any project under the jurisdiction of that department.
 - (d) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.
 - (e) The Military Department as to any project under the jurisdiction of that department.
 - (f) The Department of General Services as to all other projects.
 - (g) The High-Speed Rail Authority.
- 5. “Public works project” means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.
- 6. “Subcontractor” means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

The claimant shall furnish reasonable documentation to support the claim.

If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph **3**, below, shall apply.

1. If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.
2. Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

3. Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.
4. Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.
5. If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions

of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

This section applies to contracts entered into on or after January 1, 2017.

Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

This section shall remain in effect only until January 1, 2027, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2027, deletes or extends that date.

SECTION 7 – RESPONSIBILITIES OF THE CONTRACTOR

7-1 THE CONTRACTOR'S EQUIPMENT AND FACILITIES.

7-1.1 General. *Add the following:*

The Contractor shall provide and maintain enclosed toilets for the use of its employees engaged in the Work. These accommodations shall be maintained in a neat and sanitary condition. They shall also comply with all applicable laws, ordinances, and regulations pertaining to public health and sanitation of dwellings and camps.

7-1.2 Temporary Utility Services. *Add the following:*

The Contractor shall make arrangements and pay for telephone, electric and gas during construction, including necessary service lines to the nearest point of takeoff.

The Contractor shall use potable water for the Work. Water may be obtained from the Long Beach Water Department by applying for temporary water service at the Water Department offices at 1800 Wardlow Road, Long Beach. The Long Beach Water Department will provide a construction meter at the nearest fire hydrant available. The City will charge for water service at the standard established rates of the Long Beach Water Department.

7-2 LABOR.

7-2.2 Prevailing Wages. *Add the following:*

The contractor shall cause all work performed in connection with construction of the Work to be performed in compliance with all applicable federal and state labor standards, including the prevailing wage provisions of sections 1770 *et seq.* of the California Labor Code. The Contractor shall indemnify, defend and hold the City, its Boards, Commissions, and their officials, employees and agents ("Indemnified Parties") harmless from any and all claims, causes of action or liabilities that may be asserted against or incurred by Indemnified Parties with respect to or in any way arising from the Work's compliance with or failure to comply with applicable federal and state labor requirements including, without limitation, the requirements of California Labor Code section 1770 *et seq.*

Per diem wages shall be deemed to include employer payments for health and

welfare, pension, vacation, travel time, and subsistence pay, as provided for in the Labor Code of the State of California.

The Contractor and its subcontractors shall pay directly to each worker employed by them on the Work, who is not a member of an organization having a recognized collective bargaining agreement for that particular craft or work classification, or to make such payments irrevocably to a trustee or to a third person, pursuant to a fund, plan or program for the benefit of employees, their families and dependents, the full value of the employer payments identified in the preceding paragraphs as being included as a part of per diem wages.

(b) Apprentice Employment. The Contractor shall comply with Section 1777.5 of the Labor Code concerning the employment of apprentices by the Contractor or any subcontractor under the Contractor and, by submitting a Bid and executing the Contract, the Contractor stipulates that it shall so comply.

Section 1777.5, as amended, requires the Contractor or subcontractor employing tradesmen in any apprenticeable occupation to apply to the joint apprenticeship committee nearest the site that administers the apprenticeship program in that trade for a certificate of approval. The certificate will also fix the ratio of apprentices to journeymen that will be used in the performance of the Contract. The ratio of apprentices to journeymen in such cases shall be not less than one to five except as specified by law.

The Contractor shall contribute to funds established for the administration of apprenticeship programs if the Contractor employs registered apprentices, or journeymen in an apprenticeable trade, and if other contractors on the site are making such contributions.

Information on apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards branch office, located at 320 West 4th Street, Room 950, Los Angeles, CA

Replace Section 7-3, "Liability Insurance," and 7-4, "Workers' Compensation Insurance," with the following combined section.

7-3 LIABILITY AND WORKERS' COMPENSATION INSURANCE.

The Contractor shall comply with the following requirements and the City of Long Beach Certificate of Insurance and Endorsements.

The Contractor shall, at its sole cost and expense, procure and maintain for the duration of the Contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, Contractor's agents, representatives, officers, employees, or subcontractors. Payment for insurance shall be considered as included in the various items of Work as bid or in the lump sum price bid (as the case may be), and no additional payment will be made.

7-3.1 Minimum Insurance Requirements.

7-3.1.1 Commercial general liability insurance equivalent in scope to Insurance Services Office (ISO) form number CG 00 01 11 85 or CG 00 01 11 93 in an amount not less than \$5,000,000 per occurrence and \$5,000,000 general aggregate. Such coverage shall include but shall not be limited to broad form contractual liability, XCU (explosion, underground, and collapse) perils, products and completed operations liability, independent contractors liability, and cross liability protection. The City, its Boards and Commissions, and their officials, employees, and agents shall be named as additional insureds by endorsement equivalent in scope to ISO form CG 20 10 11 85 or to both CG 20 10 10 01 and CG 20 37 10 01. There shall be no limitations on the coverage afforded to the City, its Boards and Commissions, and their officials, employees, and agents.

7-3.1.2 Commercial automobile liability insurance equivalent in scope to ISO form CA 00 01 06 92 covering symbol 1, "Any Auto" in an amount not less than \$1,000,000 combined single limit. The City, its Boards and Commissions, and their officials, employees, and agents shall be named as additional insureds by endorsement. There shall be no limitation of coverage afforded to the City, its Boards and Commissions, and their officials, employees, and agents.

7-3.1.3 Workers' compensation insurance as required by the California Labor Code and employer's liability insurance in an amount of not less than \$1,000,000 per accident or occupational illness.

7-3.1.4 Professional liability or errors and omissions liability insurance in an amount not less than One Million Dollars (\$1,000,000) per claim covering the services provided pursuant to this Agreement.

7-3.1.5 If Contract involves the removal, transportation and/or disposal of hazardous materials, **Pollution/Environmental Impairment Liability insurance** shall be required as follows

(a) Limits of Insurance: \$1,000,000 Per Occurrence/Per Claim and \$2,000,000 Per Occurrence/Per Claim – Policy Aggregate

(b) Claims Made coverage must be maintained for a period of at least three (3) years after final payment under the Contract.

(c) The City and its officials, employees, and agents shall be added as an additional insured, and the policy shall contain no insured vs. insured exclusion.

(d) The pollution/environmental impairment liability insurance shall include coverage for, without limitation:

1. Bodily injury and property damage to third parties
2. Natural resource damages
3. Pollution clean-up costs, including restoration or replacement costs
4. Defense costs
5. Fines, penalties and punitive damages
8. Contractual Liability Coverage
9. Lead, Silica, Asbestos and Mold Coverages

All insurance coverage shall be maintained until all hazardous materials are disposed of

in an EPA licensed disposal facility and federal, state, and local environmental requirements and laws have been complied with, whether such compliance is the obligation of the Contractor, subcontractors, the City or third parties.

7-3.2 Acceptability of Insurers

The insurance required herein must be placed with carriers as follows:

7-3.2.1 Non-admitted in California and subject to Section 1763 of the Insurance Code (a current list of eligible surplus lines insurers is maintained by the California Department of Insurance at <http://www.slacal.org/resources/insurer-member-lookup> with a current financial responsibility rating of A (Excellent) or better and a current financial size category (FSC) of VIII (capital surplus and conditional surplus funds of greater than \$100 million) or greater as reported by A.M. Best company or equivalent, or

7-3.2.2 Admitted (licensed) in the State of California with a current financial responsibility rating of A (Excellent) or better and a current financial size category (FSC) of V (capital surplus and conditional surplus funds of greater than \$10 million) or greater as reported by A.M. Best Company or equivalent, or

7-3.2.3 For Worker's Compensation only, admitted (licensed) in the State of California.

7-3.3 Verification of Coverage.

The Contractor shall furnish to the City the documentation set forth in paragraph D below prior to the effective date of the Contract and, at least 30 days prior to expiration of the insurance required herein, furnish to the City renewal documentation. Each required document shall be signed by the insurer or a person authorized by the insurer to bind coverage on its behalf.

The City reserves the right to require complete, certified copies of all insurance required herein at any time.

The Contractor shall notify the City in writing within five business days if any insurance required herein is voided by the insurer or cancelled by the insured. This notice shall be sent by certified mail, return receipt requested, and shall include a certificate of insurance and the required endorsements for the replacement coverage.

7-3.4 Documentation Required.

The certificates and endorsements shall be on forms provided by the City and shall be received and approved by the City before Work commences. As an alternative, the Contractor may submit certified copies of any policy that includes the required endorsement language set forth in 7-3.4.2, 7-3.4.3, and 7-3.4.4.

7-3.4.1 Certificates of insurance evidencing the required general liability insurance, automobile liability insurance, and workers' compensation insurance required hereunder.

7-3.4.2 General liability insurance endorsements.

(a) **ADDITIONAL INSURED** endorsement equivalent in scope to ISO form CG 20 10 11 85 or to both CG 20 10 10 01 and CG 20 37 10 01 naming the City, its Boards and Commissions, and their officials, employees, and agents as additional insureds.

(b) **CANCELLATION** endorsement which provides that the City is entitled to 30 days prior written notice of cancellation or nonrenewal of the policy, or reduction in coverage, by certified mail, return receipt requested.

(c) **CONTRIBUTION NOT REQUIRED** endorsement which provides that the insurance afforded by the general liability policy is primary to any insurance or self-insurance of the City, its Boards or Commissions, or their officials, employees, or agents as respects operations of the Named Insured. Any insurance maintained by the City, its Boards or Commissions, or their officials, employees, or agents shall be in excess of Contractor's insurance and shall not contribute to it.

(d) **SEVERABILITY OF INTEREST** endorsement which provides that Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(e) **ADDITIONAL INSURED COVERAGE NOT AFFECTED BY INSURED'S DUTIES AFTER ACCIDENT OR LOSS** endorsement. The policy must be endorsed to provide that any failure to comply with the reporting provisions of the policy shall not affect coverage to the City, its Boards or Commissions, or their officials, employees, or agents.

7-3.4.3 Automobile liability insurance endorsements.

(a) **ADDITIONAL INSURED** endorsement naming the City, its Boards and Commissions, and their officials, employees, and agents as additional insureds with respect to any auto owned, leased, hired, borrowed or used by the Named Insured, in connection with this Contract.

(b) **CANCELLATION** endorsement which provides that the City is entitled to 30 days prior written notice of cancellation or nonrenewal of the policy, or reduction in coverage, by certified mail, return receipt requested.

(c) **CONTRIBUTION NOT REQUIRED** endorsement which provides that the insurance afforded by the general liability policy is primary to any insurance or self-insurance of the City, its Boards or Commissions, or their officials, employees, or agents as respects operations of the Named Insured. Any insurance maintained by the City, its Boards or Commissions, or their officials, employees, or agents shall be in excess of the Contractor's insurance and shall not contribute to it.

(d) **SEVERABILITY OF INTEREST** endorsement, which provides that the Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(e) **ADDITIONAL INSURED COVERAGE NOT AFFECTED BY INSURED'S DUTIES AFTER ACCIDENT OR LOSS** endorsement. The policy must be endorsed to provide that any failure to comply with the reporting provisions of the policy shall not affect coverage to the City, its Boards or Commissions, or their officials, employees, or agents.

7-3.4.4 Workers' compensation and employer's liability insurance endorsements.

(a) **CANCELLATION** endorsement which provides that the City is entitled to 30

days prior written notice of cancellation or nonrenewal of the policy, or reduction in coverage, by certified mail, return receipt requested.

(b) WAIVER OF SUBROGATION endorsement which provides that the insurer will waive its right of subrogation against the City, its Boards and Commissions, and their officials, employees and agents with respect to any losses paid under the terms of the workers' compensation and employer's liability insurance policy which arise from work performed by the Named Insured for the City.

7-3.5 Self-insured programs, self-insured retentions, deductibles.

7-3.5.1 Approval. Any self-insurance program, self-insured retention, or deductible must be approved separately in writing by the City's Risk Manager or designee and shall protect the City, its Boards and Commissions, and their officials, employees, and agents in the same manner and to the same extent as they would have been protected had the policy or policies not contained such self-insurance, self-insured retention, or deductible provisions.

7-3.5.2 Legal Defense. The Contractor is expressly obligated to provide for the legal defense and investigation of any claim against the City as an additional insured and for all costs and expense incidental to such defense or investigation.

7-3.5.3 Certification. The Contractor shall, upon request, complete the City's self-insurance questionnaire and required certification by the Contractor's financial officer.

7-3.6 Subcontractors.

The Contractor shall require that all subcontractors meet the requirements of this Section unless otherwise agreed in writing by the City's Risk Manager or designee.

7-5 PERMITS. *Replace this section with the following:*

The Contractor shall procure all necessary licenses and permits, including City of Long Beach permits, and give all notices necessary and incidental to the performance of the Work. However, permits or authorizations from agencies other than the City of Long Beach whose jurisdiction is applicable to City projects will be procured by the City of Long Beach. The Contractor shall cooperate with the City's procurement of those permits by supplying all required information, and arranging delivery and execution of any required construction-period permit supplements or insurance certifications.

The City will pay all fees for permits including plan checking, unless otherwise shown in these Special Provisions.

The Contractor shall not start any phase of the Work requiring a permit until that permit has been obtained.

Add the following section:

7-5.1 City Building and Fire Prevention Permits.

The Contractor shall apply for and obtain City of Long Beach Building and Fire Prevention permits for the Work. Plans for the design of the New Fire Station 9 {except

for the fire alarm system and fire sprinkler system}, have been approved by the Department of Planning and Building and the Bureau of Fire Prevention.

The contractor shall comply with codes and regulations noted by the Bureau of Fire Prevention and the Department of Planning and Building in their review and approval of fire alarm system and fire sprinkler systems at no additional cost to the City.

7-5.4 Permits.

Contractor shall arrange for receipt of permitted plans from the Department of Development Services, located on Level 2 at City Hall, 411 W Ocean Blvd. The permitted plans will be downloaded to a thumb drive, provided by the Contractor.

7-8 WORK SITE MAINTENANCE.

7-8.1 Cleanup and Dust Control. *Add the following*

The Contractor shall include all cleanup costs in its Bid. The City will make no additional payment for this work.

7-8.3 Noise Control. *Replace this subsection with the following:*

The Contractor shall keep the noise level resulting from Work operations to a minimum at all times, especially during the morning hours.

Noise control is subject to the provisions of Long Beach Municipal Code section 8.80, "Noise."

7-8.6 Water Pollution Control. *Add the following:*

Best Management Practices (BMPs) shall be defined as any program, technology, process, operating method, measure, or device that controls, prevents, removes, or reduces pollution.

At a minimum, the Contractor shall implement the following BMPs in conjunction with the Work:

Title	Number
General Site Management	
Water Conservation	NS-1
Vehicle and Equipment Cleaning	NS-8
Vehicle and Equipment Fueling	NS-9
Vehicle and Equipment Maintenance	NS-10
Employee/Subcontractor Training	-
Construction Materials and Waste Management	
Material Delivery and Storage	WM-1
Material Use	WM-2
Spill Prevention and Control	WM-4

Title	Number
Solid Waste Management	WM-5
Hazardous Waste Management	WM-6
Concrete Waste Management	WM-8
Erosion/Sediment Control	
Storm Drain Inlet Protection	SE-10

A description of each BMP is included in these Specifications. The Contractor shall have at least two readily accessible copies of these descriptions at the Work site at all times.

The Contractor shall continuously implement BMPs during the Work. The Contractor shall implement BMPs for erosion control and sedimentation during the period from October 1st to April 15th and whenever the National Weather Service predicts rain within 24 hours.

The Contractor shall conduct all aspects of the Work performed pursuant to these Plans and Specifications in accordance with all state and federal laws and regulations, including but not limited to all environmental laws and regulations, Order No. R4-2014-0024 of the California Regional Water Quality Control Board, Los Angeles Region ("Waste Discharge Requirements for Municipal Storm Water and Urban Runoff Discharges within the City of Long Beach"), and related BMPs. The City will deduct from the money due or to become due to the Contractor the total amount of any fines levied on the City, plus legal and staff costs, as a result of the Contractor's failure to comply with these provisions or less than complete implementation of the specified BMPs. In addition, the Contractor shall defend, indemnify, and hold the City harmless for any liability, loss, damage, fines, penalties, actions, costs and expenses related to the Contractor's (or its subcontractors) failure to comply with these laws and regulations.

Full payment for the implementation of BMPs, including the construction, removal, and furnishing of all necessary labor, equipment, and materials, shall be considered as included in the unit prices bid for the various items of Work or the lump sum bid (as the case may be), and no additional payment will be made.

7-8.6.3 SWPPP. *Add the following subsection:*

Projects where land disturbance totals one acre or more are required to obtain coverage and comply with the Construction General Permit (CGP). A copy of this permit and related documents may be found on the internet at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

The contractor shall develop a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall be developed, amended, and certified by a Qualified SWPPP Developer (QSD). The contractor shall create an account on the Water Boards Storm Water Multiple Application & Report Tracking System (SMARTS) and upload all relevant information.

The contractor shall be responsible throughout the duration of the contract for installing, constructing, inspecting and maintaining Best Management Practices (BMPs). The

contractor shall be responsible for and shall submit to the city copies of all contractor generated SWPPP documents, including all inspection reports, sampling test results, Rain Event Action Plans (REAP), annual reports, and other time sensitive documents. Such documentation shall be provided as soon as the information is made available and shall be provided within twenty-four (24) hours of being requested by the city.

Payment for compliance with the CGP shall be included in the various items bid and no separate payment shall be made therefor.

Add the following subsection:

7-8.8 Vermin Control.

At the time of acceptance, structures entirely constructed under the Contract shall be free of rodents, insects, vermin and pests. The Contractor shall arrange and pay for necessary extermination work as part of the Work within the Contract time. The Contractor shall use the services of a licensed exterminator in accordance with the requirements of the governing authorities. The Contractor shall be liable for injury to persons or property and responsible for the elimination of offensive odors resulting from extermination operations.

Payment for vermin control shall be considered as included in the prices for the various items of Work, and the City will make no additional payment therefor.

Add the following subsection:

7-8.9 Graffiti Removal.

Throughout all phases of construction, including suspension of Work, and until final acceptance of the Work, the Contractor shall keep the Work site free from graffiti, at the Contractor's sole cost. If graffiti appears on the Work site, the Contractor shall cover, repaint, or otherwise remove the graffiti within 24 hours of discovery. If the Contractor fails to do so, the City may take steps to remove the graffiti and the City's cost in doing so shall be deducted from the Contract Price.

Payment for graffiti removal shall be considered as included in the prices for the various items of Work, and the City will make no additional payment therefor.

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS.

Add the following:

The Contractor shall become familiar with all existing improvements and facilities, both public and private, on the Work site and provide adequate safeguards to prevent damage to existing structures and improvements. The Contractor shall repair any damage to property from any cause that might have been prevented by the Contractor, the Contractor's employees, agents or subcontractors within five calendar days after such damage occurs, at the Contractor's sole cost and expense. The Contractor shall repair water service breaks the same day. In the event that the Contractor fails to repair such damages, the City will make the repairs, or cause them to be made, and will deduct the cost of repairs from the money due or to become due to the Contractor.

Prior to constructing asphalt or concrete pavement, the Contractor shall mark on

the curb face, based on actual field measurements, the location of all manhole and utility covers, valve and meter boxes, and monuments. No guarantee is made that all such items are shown on the Plans and, if shown on the Plans, may not be shown at the correct location.

The Contractor shall protect walks and masonry paving by installing only chalk-based temporary markings in those areas.

The Contractor shall remove utility identification and other temporary markings after completion of the related Work. The City will not accept the Work until this removal is done.

The Contractor shall inventory existing signs and curb markings that are to be removed for construction. The Contractor shall bring signs or posts that are deteriorated or defaced to the attention of the Engineer. The Contractor shall reinstall signs and curb markings at their same location unless otherwise directed by the Engineer, at no additional cost to the City.

In accordance with the requirements of Section 21464 of the Vehicle Code of the State of California, no person shall without lawful authority remove any official traffic control device, guidepost or signpost placed or erected as authorized or required by law. Therefore, the Contractor shall not remove or relocate any such existing traffic control device, guidepost or signpost located within the alignment of or interfering with the new construction work required herein without first obtaining permission to do so from the Police Department of the City of Long Beach.

7-10 SAFETY.

7-10.2 Temporary Security/Construction Fence. Add the following to this subsection:

The Contractor shall install temporary Project site security/construction fence(s) indicated on Drawings or as required for safety and as specified herein. New or used material may be furnished. Security of Project site and contents is a continuous obligation of Contractor.

Unless otherwise indicated or specified, security fence shall be constructed of 6-foot high chain link fencing with a 6-foot high windscreen. Space posts not to exceed ten feet on centers. Posts shall be of following nominal pipe dimensions: terminal, corner, and gatepost 2 ½-inch, line posts 2-inch. Chain link fence shall be not less than #13 gauge, 2-inch mesh, and in one width. Posts, fence and accessories shall be galvanized and as follows:

1. Shall be set in the earth a depth of 24-inch with soil firmly compacted around post, unless required otherwise in writing by Construction Manager.
2. Fence fabric shall be attached to posts with #14 gauge tie wire at 16 inches on center. A #6 gauge steel tension wire with turnbuckles shall be installed at top and bottom

of barricade fencing. Wire tie fabric to tension wires at 18" centers.

3. Windscreen/Graphic Fence Wrap shall be attached to fence fabric and steel tension wires at 18-inch centers with a minimum of #14 gauge tie wire. Windscreen shall be maintained and all rips, tears, missing sections shall be corrected upon notification by the Construction Manager. Refer to section 7-10.3 for the "Graphic Fence Wrap" guidelines.

4. Chain link fencing shall be free from barbs, icicles or other projections resulting from galvanizing process. Fence having such defects will be replaced even if it has been installed.

5. Gates shall be fabricated of steel pipe with welded corners, and bracing as required. Fence and fabric to be attached to frame at 12-inch centers. Provide all gate hardware of a strength and quality to perform satisfactorily until barricade is removed upon Substantial Completion of the Work. Each gate shall have a chain and padlock. Provide two gate keys to OAR. At Substantial Completion of the Work, remove barricade from Project site, backfill and compact fence footing holes. Existing surface paving that is cut into or removed shall be patched and sealed to match surrounding areas.

6. At Contractor's expense and without limitation remove or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

7-10.3 Graphic Fence Wrap for Temporary Security/Construction Fence

a. Purpose, This guideline outlines requirements for temporary fencing on public construction projects. To minimize the visual impacts of construction activity, the standards contained herein are being implemented to ensure that fencing is aesthetically pleasing and enhances the surrounding environment as well as provide a level of consistency across the City.

b. Scope, This fencing guideline is applicable to this Project. Prior to the start of any on-site/offsite construction, the General Contractor shall submit a construction plan for pedestrian protection, construction area perimeter fencing with custom-printed screen(s), street lane closures, construction staging, shoring excavations and the routing of construction vehicles (excavation hauling, concrete and other deliveries, etc.). General Contractor shall install FenceScreen.com Custom Printed Flex Mesh screen(s), Series 411 – 100% blockage, or equivalent, fence screening along the perimeter of the development site during construction of the on-site improvements until final inspection by the City. The graphics shall depict positive images of the City or other artistic concepts. Prior to submitting the graphic design for printing, the Contractor shall consult with PW to review and approve.

The Contractor shall maintain a temporary chain link fence around the project site and any and all construction related staging and other areas at all times throughout the duration of the construction. The fence shall be a minimum of 6 feet high with a new, high quality windscreen fabric covered with graphics to screen construction activities from the

public. Contractor to assume 50% of one side of the windscreen will be printed with color graphics. Graphics to be supplied by the City but the layout and panel graphic size is entirely the contractor responsibility for coordination of layout. Gates for the temporary fencing shall be maintained closed and locked at all times during non-working hours to prevent unauthorized access to the construction area and to open excavations. The Contractor shall submit details of the temporary fencing and fabric mesh (assume at least 100% blockage) for review and approval, including footing or support details demonstrating that the fence has adequate lateral support for all anticipated loads. At the conclusion of the construction activities, the windscreen shall be delivered to the City or disposed of at contractors cost.

c. Requirements:

- 50% of fenced area must contain city images. The remaining 50% must be a new blue windscreen with no rips, tears, etc.
- Thumbnails of the city images will be given to the contractor. The contractor is responsible for working with a vendor to layout the graphics. The graphics must cover the fence from top to bottom. The graphic images shall not be cut in half but the graphic images should be continuous to each panel of fence. The order and sequence of relevant images will be reviewed by the City for application at this site.
- The total square footage of fenced area shall be calculated by multiplying the height of the fence by the length of perimeter fencing.

d. Submittals: The following items shall be submitted to PW for review and approval:

- Plan drawing highlighting the perimeter fencing to be installed.
- Color elevation depicting the images to be installed.
- Breakdown of the total image areas per the categories outlined above within the "Requirements" section.
- No deviations will be allowed. All submittal items shall be packaged together and submitted for approval prior to fabrication and installations.

e. Maintenance and Replacement, All fencing and color graphic screening must be maintained in good condition. Damaged fencing must be replaced within 48 hours and faded or torn graphics must be replaced in one week at contractor's cost.

7-10.4 Safety. *Add the following:*

At Contractor's sole expense, the Contractor shall take such precautions as are necessary to protect workers engaged in the performance of the Work and prevent accidents or injury to workers and others. The Contractor shall comply with all safety orders of the Division of Industrial Safety of the State of California as well as applicable Federal regulations insofar as they pertain to the Contractor's operations. If any unusual or hazardous condition exists by reason of the Work or if any unusual or hazardous condition arises out of the performance of the Work, or if a condition involving a peculiar risk of bodily harm to workers or others arises, then the Contractor shall take all

precautions necessary to protect workers and others.

7-10.5 Haul Routes. *Replace this with the following:*

Haul routes shall be determined by the Contractor and approved by the Engineer.

7-10.6 - Construction Area Information Sign

The contractor shall be responsible for installing one project construction sign. The graphic will be provided by the City which shows an image of the project and other detailed information. The project image sign size shall be 4 feet in height and 8 feet wide imaged on white aluminum metal. The project sign shall be attached to posts where the bottom of the sign is 7 feet from the ground. Contractor is responsible for ensuring the project sign does not interfere with operations and must seek City approval for location. The sign shall have graffiti resistant coating.

Payment for the construction area information signs shall be considered as included in *the bid* and no additional payment will be made.

Add the following section

7-15 TAXES.

Bidders shall make no mention in the Bid of sales tax, use tax, or any other tax, as all amounts bid will be deemed to include all taxes.

The Contractor shall pay all sales, consumer, use, and other taxes required to be paid in accordance with the laws and regulations of the place of the Work that are applicable during the performance of the Work. The City is not exempt from sales tax.

The Contractor shall cooperate with the City to the full extent possible to maximize the local allocation of California sales and use tax to the City. Such cooperation shall include but not be limited to:

(a) Use Tax Direct Payment Permits. The Contractor shall apply for, obtain and utilize, to the maximum extent reasonable, a California Use Tax Direct Payment Permit. The application for such permit is available from (and a copy of each quarterly tax return shall be sent to):

City Controller
City of Long Beach
411 W. Ocean Boulevard, 6th Floor
Long Beach, CA 90802

(b) Purchases of \$500,000 or More. The Contractor shall require vendors and suppliers located outside California from whom the Contractor makes purchase of \$500,000 or more to allocate the use tax to the City.

Additional information regarding use tax and the Permit can be found in the State of California Board of Equalization, Sales and Use Tax Regulations, Regulation 1699.6,

Use Tax Direct Payment Permits, or on the web site for the Board of Equalization at <http://www.boe.ca.gov/sutax/sutprograms.htm>.

Add the following section:

7-16 INDEMNIFICATION.

7-16.1 General. The Contractor shall indemnify, hold harmless, and protect City, its Boards, Commissions, and their officials, employees and agents (“Indemnified Parties”) from and against any and all demands, liability, loss, suit, claim, action, cause of action, damage, cost, judgment, settlement, decree, arbitration award, stop notice, penalty, loss of revenue, and expense (including, but not limited to, any fees of accountants, attorneys, experts or other professionals, and costs of investigation, mediation, arbitration, litigation and appeal), in law or in equity, of every kind and nature whatsoever, arising out of or in connection with, resulting from or related to, or claimed to be arising from the Contract or the Work performed by Contractor, or any of its officers, agents, employees, subcontractors of any tier, material suppliers, or any person for whose acts any of them may be liable, regardless of whether such claim, suit or demand is caused, or alleged to be caused, in part, by an Indemnified Party including, but not limited to, liability arising from:

- a) Bodily or personal injury, emotional injury, sickness or disease, or death to any persons;
- b) Damage to property, including property under the care and custody of City;
- c) Civil fines or penalties;
- d) Any dangerous, hazardous, unsafe or defective condition of, in or on the Work site, of any nature whatsoever, which may exist by reason of any act, omission, neglect, or any use or occupation of the Work site by Contractor, its officers, agents, employees or subcontractors;
- e) Any operation conducted upon or any use or occupation of the Work site by Contractor, its officers, agents, employees, or subcontractors under or pursuant to the provisions of the Contract or otherwise;
- f) Any act, omission or negligence of Contractor, its officers, agents, employees, or subcontractors;
- g) Infringement of any patent rights, licenses, copyrights or intellectual property which may be brought against the Contractor or City arising out of Contractor’s Work, for which the Contractor is responsible;
- h) Any and all claims against City seeking compensation for labor performed or materials used or furnished to be used in the Work or alleged to have been furnished, including all incidental or consequential damages resulting to City from such claims;
- i) Failure to comply with any applicable law, statute, code, ordinance, regulation, permit, or orders, including, without limitation, all applicable federal and state labor standards, including the prevailing wage provisions of sections 1770 *et seq.* of the California Labor Code;
- j) Any misrepresentation, misstatement or omission with respect to any

statement made in or any document furnished by the Contractor in connection therewith;

k) Any breach of any duty, obligation, or requirement under the Contract Documents.

All of the above are collectively hereafter referred to as "Claims" and individually as a "Claim".

7-16.2 Defense of Claims, Enforcement and Restrictions.

a) In addition to Contractor's duty to indemnify, Contractor shall have a separate and wholly independent duty to defend Indemnified Parties against all Claims. If any Claim is alleged or brought against Indemnified Parties, Contractor shall defend Indemnified Parties at Contractor's expense by legal counsel approved by City and shall continue this defense until the Claims are resolved, whether by settlement, judgment or otherwise. No finding or judgment of negligence, fault, breach, or the like on the part of Contractor shall be required for the duty to defend to arise. City shall notify Contractor of any Claim, shall tender the defense of the Claim to Contractor, and shall assist Contractor, as may be reasonably requested, in the defense.

b) Contractor's obligations under this Section 7-16 shall apply regardless of whether or not such Claim was caused in part or contributed to by any actual or alleged negligent act or omissions of an Indemnified Party.

c) If a court of competent jurisdiction determines that a Claim was caused by the active negligence, sole negligence or willful misconduct of Indemnified Parties, Contractor's costs of defense and indemnity shall be (1) reimbursed in full if the court determines sole negligence by the Indemnified Parties, or (2) reduced by the percentage of active negligence and/or willful misconduct attributed by the court to the Indemnified Parties.

d) If this Contract includes work or services performed by a design professional, such as an architect, landscape architect, professional engineer or professional land surveyor, subject to California Civil Code Section 2782.8, Contractor shall defend and indemnify Indemnified Parties against design-related Claims that arise out of, pertain to, or relate to the negligence, recklessness, or willful misconduct of the Contractor or a subcontractor.

e) Contractor agrees to obtain executed indemnity agreements with provisions identical to those set forth in this section from each and every subcontractor in performance of the Contract.

f) Failure of City to monitor compliance with these requirements imposes no additional obligations on City and will in no way act as a waiver of any rights hereunder. In the event of any claim, suit or demand made against any Indemnified Parties, the City may in its sole discretion reserve, retain, or apply any monies due to the Contractor under the Contract for the purpose of resolving such claims; provided, however, that the City may release such funds if the Contractor provides the City with reasonable assurance of protection of the City's interests. The City shall in its sole discretion determine whether such assurances are reasonable. Contractor's obligations under this Section 7-16 extend to claims occurring after termination of the Contractor's performance of the Contract or final payment to the Contractor.

7-16.3 No Limitations. Contractor's obligations under this Section 7-16 are in addition to any other rights or remedies which the Indemnified Parties may have under the law or under the Contract Documents. Contractor's indemnification and defense obligations set forth in this Section 7-16: (i) are separate and independent from the insurance provisions set forth above; and (ii) do not limit, in any way, the applicability, scope, or obligations set forth in the insurance provisions. In claims, suits, or demands against any Indemnified Party by an employee of the Contractor, a subcontractor, anyone directly or indirectly, employed by them, or anyone for whose acts they may be liable, the Contractor's indemnification and defense obligations shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

SECTION 8 – FACILITIES FOR AGENCY PERSONNEL

No facilities for City personnel are required for this Work.

SECTION 9 – MEASUREMENT AND PAYMENT

9-3 PAYMENT.

9-3.1 General. *Add the following:*

The bid items are lump sum. The Contractor shall visit the site for the purpose of becoming thoroughly familiar with the existing site conditions and the scope of work required to complete the proposed improvements in place and fully operational in accordance with the plans and specifications. The Contractor shall furnish whatever quantities are actually needed to complete the Work.

The City will make payment in the due course of its payments.

9-3.2 Partial and Final Payment. *Replace the third paragraph with the following:*

From each progress payment, 5 percent will be deducted and retained by the City. The City will withhold up to 5 percent of the total Contract amount until acceptance of the Work.

The City reserves the right to delay partial and final payments until the Contractor submits documentation required in these Specifications, including Labor Compliance documentation (see Subsection 7-2.2) and construction schedule updates (see Section 6-1).

**DIVISION I – TECHNICAL REQUIREMENTS - OFF-SITE
IMPROVEMENTS NOT USED, REFER TO
GREENBOOK 2015 EDITION AND DIVISION H**

DIVISION J
NOT USED

DIVISION K
TECHNICAL
REQUIREMENTS, ON-SITE
IMPROVEMENTS

DIVISION 01
GENERAL
REQUIREMENTS

SECTION 011000
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of Contract.
 - 3. Owner-furnished products.
 - 4. Use of premises.
 - 5. City's occupancy requirements.
 - 6. Work restrictions.
 - 7. Off-Site improvements.

- B. Related Documents: Drawings, Division H – General Requirements, Division I – Technical Requirements: Off-Site Improvements, Division J – Technical Requirements: Traffic Signals and Equipment, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 WORK COVERED BY THE CONTRACT DOCUMENTS

- A. Project Identification: City of Long Beach Fire Station No. 9.
 - 1. New Fire Station No. 9 and On-Site Improvements.
 - 2. Off-Site Street, Alley and Utility Improvements.
 - 3. Electrical Service Undergrounding.
 - 4. New Traffic Signal and Related Improvements.

- B. Project Location:
 - 1. 4101 Long Beach Boulevard, Long Beach, California, CA 90807.

- C. Owner: City of Long Beach
 - 1. Owner's Representative: Long Beach Department of Public Works Agency.

- D. Architect of Record (AOR):
 - 1. Mary McGrath Architects, 610 16th Street, Suite 219, Oakland CA 94612.

- E. The Work consists of the following:
 - 1. Removal of all existing buildings, ramps, stairs, decks, associated utilities and site infrastructure.

SECTION 011000 – SUMMARY OF THE WORK

2. Work includes New Fire Station No. 9, on-site work, off-site work in the public right of way including a new water main, traffic signal, street and alley-way improvements. :
 - a. The City of Long Beach Public Works Department together with the City of Long Beach Fire Department propose to construct a replacement Fire Station No. 9. The Project site is at the corner of Long Beach Boulevard and Randolph Place in the Bixby Knolls Area of North Long Beach. The development area encompasses 16,829 square feet. There is an existing business office building located on the site and all existing site improvements will be demolished as a part of the project.
 - b. The proposed 12,780-square-foot, two-story fire station will house eight (8) on-duty firefighters in a 24-hour shift and includes space for a trainee. The station is designed to accommodate a Type 1 Fire Engine, a Rescue Company and a Battalion Chief, as front-line responding companies. There is storage capacity for a Reserve Type 3 Engine in the bay and staging area in the rear for a fire truck. The station's core facilities (kitchen, dining, dayroom, restrooms, fitness room, and apparatus support spaces) must accommodate eight on-duty personnel. The overall height of the structure fire station is 33 feet.
 - c. The fire station includes the following elements:
 - 1) First Level:
 - a) Three drive-through apparatus bays.
 - b) Apparatus support spaces including a workshop, medical storage and clean-up, turnout storage, and related janitorial facilities.
 - c) Public lobby, meeting room, accessible restroom, and a station office.
 - 2) Second Level:
 - a) Battalion Chief and Captains' offices.
 - b) Kitchen, storage pantry, dining, dayroom, and laundry room.
 - c) Private sleeping quarters with unisex restrooms.
 - d) Mechanical, electrical, communications rooms.
 - e) Vertical circulation includes two sets of stairs and an elevator.
 - d. The site will be redeveloped with concrete paving, site lighting, a trash enclosure, transformer, landscaping, fencing, and gates. On the west property line, there is a row of existing mature trees that will be protected in place. The balance of the project landscaping is designed to follow the City's landscape design requirements for drought-tolerant plant selection and low flow irrigation systems.
 - e. The site will be accessed by vehicle and apparatus traffic through the alley. A secure firefighter parking area is provided. This parking area includes an exit driveway onto Long Beach Boulevard. There is a trash

SECTION 011000 – SUMMARY OF THE WORK

- enclosure along the north property line adjacent to the alley and a built-in BB&Q patio at the southwest corner of the site.
- f. Off-site improvements include the previously mentioned driveway apron onto Long Beach Blvd and a new response apron at E. Randolph Place. A keep clear zone will be striped in front of the apparatus bay apron. The alley on the north side of the property will be widened 2 feet, 6 inches toward the fire station property and will be reconstructed to the full width with underground utilities and new paving. The sidewalks and adjacent paving along the Long Beach Boulevard and E. Randolph Place street frontages will be replaced and existing street trees replaced.
 - g. The contractor shall prepare a Traffic Control Plan (TCP), prepared by a licensed Traffic Engineer. The TCP will be designed to facilitate the construction improvements and provide the necessary provisions for pedestrian and cyclist safety, such as dedicated paths or safe crossing points. Provide safe access for public and construction vehicles and minimize disruption to the nearby businesses and the public in general, caused as a result of the construction operation. The plan shall be submitted to the City Traffic Bureau for approval. The scope shall include all revisions necessary to obtain approval for the plan by City Traffic Bureau.
 - h. A new watermain line will be installed as a part of the project.
 - i. Installation of new sewer, gas and drain systems.
 - j. Installation of underground conduits for dry utilities.
 - k. A traffic signal with associated equipment shall be installed at the intersection of E. Randolph Place and Long Beach Boulevard. The traffic signal will be able to be activated from the fire station to allow a clear response path onto Long Beach Blvd. New roadway striping will be installed.
 - l. The overhead electrical service along Long Beach Boulevard will be undergrounded as a part of this project. The contractor shall work closely with Southern California Edison (SCE) and all other utility providers with services on the poles for the undergrounding of these utilities.
 - m. The project is being designed to achieve LEED Silver certification and will include solar panels on the roof, low flow plumbing fixture, LED lighting, energy efficient heating and cooling systems supported by highly insulated roof and wall assemblies to reduce heating and cooling costs. All roof mounted equipment is shielded by a mechanical screen.
3. Fire sprinkler systems (building and underground), sprinkler monitoring system, light pole footings, photovoltaic system and fall protection system, at roof, and Generator/Tank (LBFD CUPA) are design/build systems. Systems require deferred approvals from the local authority having jurisdiction. The Contractor is responsible for submitting and obtaining approval from the authorities having jurisdiction prior to installing systems.

SECTION 011000 – SUMMARY OF THE WORK

See specification sections for the aforementioned systems for additional requirements.

1.03 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract with a lump sum bid.

1.04 OWNER FURNISHED PRODUCTS

- A. Owner Furnished Owner Installed Equipment (OFOI): The Contractor is required to install support infrastructure and systems, as shown in the Contract Documents, prior to calling for OFOI equipment installation.
 - 1. OFOI Products provided by the City:
 - a. Data systems. Head end equipment. All wiring, terminations, support structures, conduit and boxes installed by contractor.
 - b. AV systems. Head end equipment will be OFOI, All conduit, boxes, wiring, terminations and mounting brackets (wall and ceiling mounted) installed by contractor.
 - c. Bedroom furniture (bedframe and mattress), office furniture, and fitness equipment.
 - d. Security systems. Site security head end equipment, door proximity card readers and cameras. Conduit, wiring, and back-boxes by Contractor.
- B. Owner Furnished Contractor Installed Equipment (OFCI): The Contractor is required to install equipment noted as OFCI in the contract documents.
 - 1. The TV's, smartboards, and Monitors are OFCI. The TV/monitor mounting brackets are CFCI per Section 115200 AUDIO-VISUAL EQUIPMENT
- C. All other equipment shown in the Contract Documents, except where specifically noted as OFOI or OFCI, shall be Contractor Furnished Contractor Installed (CFCI).

1.05 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by City's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine constructions operations to within the property line boundary indicated on the drawings, unless noted otherwise.

SECTION 011000 – SUMMARY OF THE WORK

1.06 CITY'S OCCUPANCY REQUIREMENTS

- A. City Occupancy of Completed Areas of Construction: City reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before City occupancy.
 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before City occupancy.
 3. Before partial City occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, City will operate and maintain mechanical and electrical systems serving occupied portions of building.
 4. On occupancy, City will assume responsibility for maintenance and custodial service for occupied portions of building.

1.07 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, except as otherwise indicated.
1. Weekend Hours: As permitted by City and/or local governing jurisdiction.
 2. Early Morning Hours: Comply with regulations by authorities having jurisdiction for restrictions on noisy work.
 3. Hours for Utility Shutdowns: Comply with regulations established by each utility City governing utility scheduled for shutdown.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by City or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Obtain written permission to shut down a utility from the governing agency for each utility requiring a shutdown.
 2. Notify City Project Manager not less than 7 days in advance of proposed utility interruptions.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 012500

SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this

1.02 REQUESTS FOR "OR EQUAL" SUBSTITUTION

- A. Only written requests with complete substantiating data for evaluation will be considered.
 - 1. Any Bidder desiring to bid an “approved equal” item shall submit a request to do so to the Engineer in writing no later than fourteen (14) calendar days prior to the date of the Bid opening. The request shall include all data required to substantiate that the substitute item is equal. The engineer will notify the bidder in writing of the approval or disapproval of the proposed item no later than 5 calendar days prior to the date of the Bid opening. Submit written approvals with your Bid.
 - 2. Requests received late will not be considered.
- B. In making request for substitution, or in using an approved substitute item, Supplier and Contractor:
 - 1. Shall have investigated proposed product or method and have determined that it is equal or superior in all respects to that specified, and that it will perform intended function.
 - 2. Shall provide same warranty for substitute item as for product or method specified.
 - 3. Where substitute manufacturers are provided with different control panels, starters, and electrical characteristics from scheduled equipment, Contractor shall make installation complete and pay all additional costs.
 - 4. Shall waive all claims for additional costs or time related to substitution which subsequently become apparent.
 - 5. Shall pay all redesign and other costs resulting from substitution.
 - 6. Shall acknowledge acceptance of these provisions in request.

SECTION 012500 – SUBSTITUTIONS

1.03 SUBSTITUTION SUBMITTAL

- A. Submit complete data substantiating compliance of proposed substitution with the Request for Substitution.
- B. For products:
 - 1. Product identification, including manufacturer's name.
 - 2. Manufacturer's literature, marked to indicate specific model, type, size, and options to be considered:
 - a. Product description.
 - b. Performance and test data.
 - c. Reference standards.
 - d. Difference in power demand, air quantities, etc.
 - e. Dimensional differences from specified unit.
 - 3. Full size samples if requested by Engineer.
 - 4. Engineer reserves right to retain sample until physical units are installed on project for comparison purposes. Sample will then be returned to Contractor.
 - 5. Contractor to pay all costs of furnishing and return of samples.
 - 6. Engineer is not responsible for loss of or damage to samples.
 - 7. Name and address of at least five similar projects and name of representative Engineer can contact; to discuss product, installation, and field performance data.
- C. For construction methods:
 - 1. Detailed description of proposed method.
 - 2. Illustrate with drawings.
- D. Itemized comparison of proposed substitute to specified item.
- E. Accepted substitutions will not allow any contract time extensions.
- F. Cost of proposed substitution in comparison with product or method specified.

1.04 REVIEW/APPROVAL OF SUBSTITUTIONS

- A. Substitutions will not be approved by Agency if (in Agency's sole judgment):
 - 1. They are not submitted in accordance with this Section.
 - 2. Acceptance will require substantial revision of Contract Documents and/or building spaces.
 - 3. Request for substitution does not indicate specific item for which request is submitted.
 - 4. They propose acceptance of manufacturer without presenting manufacturer's product/model name or number.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Administrative and procedural requirements for handling and processing Contract modifications.
 - 2. “Architectural Supplemental Instruction” form for City Initiated Proposal Requests.
 - 3. “Proposal Request” form for Contractor-Initiated Proposals.
 - 4. “Change Order” form for issuing Change Orders.
- C. Related Sections:
 - 1. Section 012500, SUBSTITUTIONS, for administrative procedures for handling requests for substitutions made after Contract award.
 - 2. Section 012610, REQUESTS FOR INFORMATION, for RFI submittal requirements.
 - 3. Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT, for submittal methods and record management.
 - 4. Section 013300, SUBMITTAL PROCEDURES, for Submittal Requirements and Review.
 - 5. Section 016000, PRODUCT REQUIREMENTS, for administrative procedures for handling requests for substitutions made after Contract award.

1.02 MINOR CHANGES IN THE WORK

- A. Engineer will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on the "Architect's Supplemental Instruction" or "ASI" form.

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

1.03 PROPOSAL REQUESTS

- A. City-Initiated Proposal Requests:
1. Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time.
 2. If necessary, the description will include supplemental or revised Drawings and Specifications.
 3. The “Architect’s Supplemental Instruction” form will be used for requesting a proposal from Contractor.
 4. Proposal Requests issued by Construction Manager are for information only.
 5. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 6. Within seven working days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor’s Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
 - e. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals:
1. If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a “Contractor Proposal” form to Construction Manager as follows:
 - a. Include a statement outlining reasons for the change and the effect of the change on the Work.
 - b. Provide a complete description of the proposed change.
 - c. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - d. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made.
 - e. If requested, furnish survey data to substantiate quantities.
 - f. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - g. Include an updated Contractor’s Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

- h. Use available total float before requesting an extension of the Contract Time.
 - i. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
2. Proposal Request Form:
- a. Use "Contractor Proposal Form" approved by City Engineer.

1.04 CHANGE ORDER PROCEDURES

- A. On City's approval of a Proposal Request, Construction Manager will issue a Change Order for signatures of City and Contractor on "Change Order" form approved by City Engineer.

1.05 CONSTRUCTION CHANGE DIRECTIVE

- A. Direction to Proceed:
 - 1. Construction Manager may issue Direction to Proceed with Work on the "Architect's Supplemental Instruction" form.
 - 2. Direction to Proceed instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 3. Direction to Proceed shall contain a complete description of change in the Work.
 - 4. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation:
 - 1. Maintain detailed records of work done on a time and material basis.
 - 2. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
 - 3. Support each claim for work done on a time and material basis with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.06 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

- B. Promptly revise progress schedules to reflect any changes in Contract Time, revise sub-schedules to adjust time for other items of work affected by the change, and resubmit.
- C. Per the requirements of Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT, all change documents are to be issued, records transmitted and maintained in the Procore data base. Promptly enter changes in Project Record Documents per Section 017839, PROJECT RECORD DOCUMENTS.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION 012600

SECTION 012610

REQUESTS FOR INFORMATION

PART 1 - GENERAL

1.01 DEFINITIONS

- A. Request for Information/Interpretation (RFI).
 - 1. Form completed in Orion by and submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as RFI.
 - 2. A properly prepared request for information. Interpretation shall include a detailed written statement that indicated the specific Drawings or Specification in need of clarification and the nature of the clarification requested.
 - a. Drawings shall be identified by Drawing number and location on the Drawing sheet.
 - b. Specification shall be identified by Section number, page, and paragraph.
 - 3. Request for Information: Request made by Contractor concerning items not indicated on Drawing or contained in Specifications that is required to properly perform the Work.

- B. Improper and Frivolous RFIs.
 - 1. RFIs that are not properly prepared, or
 - 2. RFIs that request information that is clearly shown on the Contract Documents.
 - 3. Improper or Frivolous RFIs shall be processed by the Consultant at the Consultant's standard hourly rate and the Consultant will charge the Agency, and such costs will be deducted from monies still due to the Contractor. The Contractor shall be notified by the Agency prior to the processing of improper RFIs.

1.02 CONTRACTOR'S REQUEST FOR INFORMATION

- A. RFI shall be submitted through Orion.
 - 1. Forms shall be completely filled-in as indicated by the Agency.
 - 2. RFIs numbering will be assigned by Orion.
 - 3. Each page of attachments to RFIs shall bear RFI number and shall be consecutively number in chronological order.
 - 4. If approved by the Agency, RFI will be closed in Orion.

SECTION 012610 – REQUESTS FOR INFORMATION

- B. When the Contractor is unable to determine from the Contract Documents, the material process or system to be installed, the Agency shall be requested to make a clarification of the indeterminate item.
- C. Contractor shall endeavor to keep the number of RFIs to a minimum. In the event that the process becomes unwieldy, in the opinion of the Agency, because of the number and frequency of the RFIs submitted, the Agency may require the Contractor to send an email approval of draft RFI prior to submitting through Orion.
- D. RFIs shall be originated by the Contractor.
 - 1. RFIs from Subcontractors or suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Agency. Otherwise, RFI's sent directly from Subcontractor to Agency shall be immediately rejected.
 - 2. RFIs from subcontractors or material suppliers sent directly to the Agency shall not be accepted and will be returned unanswered.
- E. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFIs which request information available in the Contract Documents will be deemed "improper" or "frivolous" as noted above.
- F. In cases where RFIs are issued to request clarification of coordination issues, the Contractor shall propose the suggested solution using drawings or sketches drawn to scale and attach them to the RFI. RFIs which fail to include a suggested solution may be returned unanswered with a requirement that the Contractor submit a complete request.
- G. RFIs shall not be used for the following purposes:
 - 1. To request approval of submittals.
 - 2. To request approval of substitutions.
 - 3. To request changes which are known to entail additional cost or credit.
 - 4. To request different methods of performing Work than those drawn and specified.
- H. In the event the Contractor believes that a clarification by the Agency results in additional cost or time, Contractor shall not proceed with the Work indicated by the RFI until a Contract Change Orders is executed. RFIs shall not justify a cost increase or a change in the Project schedule.
 - 1. Answered RFIs shall not be construed as approval to perform extra Work.
 - 2. Unanswered RFIs will be returned with notation: Not Reviewed or Rejected.
- I. Contractor shall allow a reasonable time for review and response time for RFIs.
 - 1. The Agency has a minimum of 10 working days to respond to RFIs.

SECTION 012610 – REQUESTS FOR INFORMATION

2. RFIs received after 1:00 p.m. will be considered as received the following working day.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 012900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Administrative and procedural requirements necessary to prepare and process Applications for Payment.
- C. Related Sections:
 - 1. Section 012600, CONTRACT MODIFICATION PROCEDURES, for administrative procedures for handling changes to the Contract.
 - 2. Section 013216, CONSTRUCTION PROGRESS SCHEDULE, for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.02 DEFINITIONS

- A. Schedule of Values:
 - 1. A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.03 SCHEDULE OF VALUES

- A. Coordination:
 - 1. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 2. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Bid Item Schedule
 - b. Application for Payment forms with Continuation Sheets.
 - c. Submittals Schedule.
 - d. Contractor's Construction Schedule.

SECTION 012900 – PAYMENT PROCEDURES

3. Submit the Schedule of Values to Engineer through Construction Manager at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content:
1. Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values.
 2. Provide at least one line item for each Specification Section.
 3. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 4. Submit draft of Payment Request Form.
 5. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 6. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports.
 - a. Coordinate with the Project Manual table of contents.
 - b. Provide several line items for principal subcontract amounts, where appropriate.
 - c. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
 7. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 8. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
 9. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

SECTION 012900 – PAYMENT PROCEDURES

10. Each item in the Schedule of Values and Applications for Payment shall be complete.
 - a. Include total cost and proportionate share of general overhead and profit for each item.
 - b. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
11. Schedule Updating:
 - a. Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and Construction Manager and paid for by City.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times:
 1. The date for each progress payment shall conform to the City's normal invoice/payment processing schedule.
 2. The period of construction Work covered by each Application for Payment is 1 month.
- C. Payment Application Forms:
 1. Use City's Payment Request Form as form for Applications for Payment.
- D. Payment Application Forms:
 1. Use forms provided by City for Applications for Payment.
 2. Sample copies are included at end of this Section.
- E. Application Preparation:
 1. Complete every entry on form.
 2. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor.
 3. Construction Manager will return incomplete applications without action.
 4. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 5. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

SECTION 012900 – PAYMENT PROCEDURES

- F. Transmittal:
1. Submit three signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours.
 2. One copy shall include conditional and unconditional waivers of lien and similar attachments.
 3. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien:
1. With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 2. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 3. When an application shows completion of an item, submit final or full waivers.
 4. City reserves the right to designate which entities involved in the Work must submit waivers.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to City.
- H. Waivers of Mechanic's Lien:
1. With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 2. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 3. When an application shows completion of an item, submit final or full waivers.
 4. City reserves the right to designate which entities involved in the Work must submit waivers.
 5. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 6. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to City.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).

SECTION 012900 – PAYMENT PROCEDURES

7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire City's insurance.
 16. Initial settlement survey and damage report if required.
 17. Conditional lien waivers for work claimed. (All future Applications for Payment shall also include unconditional lien waivers for prior payments made by the City to the contractor).
- J. Application for Payment at Substantial Completion:
1. After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 2. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 3. This application shall reflect Certificates of Partial Substantial Completion issued previously for City occupancy of designated portions of the Work.
- K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. "Contractor's Affidavit of Payment of Debts and Claims."
 5. "Contractor's Affidavit of Release of Liens."
 6. "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when City took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final, liquidated damages settlement statement.

SECTION 012900 – PAYMENT PROCEDURES

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - a. Coordination Drawings.
 - b. Administrative and supervisory personnel.
 - c. Project meetings.
 - d. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections:
 - 1. Section 013216, CONSTRUCTION PROGRESS SCHEDULE, for preparing and submitting Contractor's Construction Schedule.
 - 2. Section 017300, EXECUTION, for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017300, EXECUTION, and Section 017700, CLOSEOUT PROCEDURES, for coordinating Contract closeout.

1.02 COORDINATION

- A. Coordination:
 - 1. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
 - 2. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 3. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

4. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 5. Make adequate provisions to accommodate items scheduled for later installation.
 6. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination.
1. Include such items as required notices, reports, and list of attendees at meetings.
 2. Prepare similar memoranda for City and separate contractors if coordination of their Work is required.
- C. Administrative Procedures:
1. Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work.
 2. Such administrative activities include, but are not limited to, the following:
 - a. Preparation of Contractor's Construction Schedule.
 - b. Preparation of the Schedule of Values.
 - c. Installation and removal of temporary facilities and controls.
 - d. Delivery and processing of submittals.
 - e. Progress meetings.
 - f. Preinstallation conferences.
 - g. Project closeout activities.
 - h. Startup and adjustment of systems.
 - i. Project closeout activities.
- D. Conservation:
1. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 2. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.
 3. Refer to other Sections for disposition of salvaged materials that are designated as City's property.

1.03 SUBMITTALS

- A. Coordination Drawings:
1. Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

components or if coordination is required for installation of products and materials fabricated by separate entities.

2. Content:
 - a. Project-specific information, drawn accurately to scale.
 - b. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data.
 - c. Include the following information, as applicable:
 - 1) Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - 2) Indicate required installation sequences.
 - 3) Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
 - 4) Provide alternate sketches to Engineer for resolution of such conflicts.
 - 5) Minor dimension changes and difficult installations will not be considered changes to the Contract.
3. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
4. Number of Copies:
 - a. Submit one electronic copy of each submittal per Section 013300 Submittal Procedures and Section 013123 Web-based Construction Management.
 - b. Engineer, through Construction Manager, will return one electronic copy.
 - c. Submit one electronic copy where Coordination Drawings are required for operation and maintenance manuals.
 - d. Engineer and Construction Manager will return one reviewed electronic document after review.
 - e. Retain the final electronic document as a Project Record Drawing.
5. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names:

1. Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.
2. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers.
3. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
4. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

1.04 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.05 PROJECT MEETINGS

- A. Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Engineer of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Engineer, within three days of the meeting.
- B. Preconstruction Conference:
 - 1. Schedule a preconstruction conference before starting construction, at a time convenient to City, Construction Manager and Engineer, but no later than 15 days after execution of the Agreement.
 - 2. Hold the conference at Project site or another convenient location.
 - 3. Conduct the meeting to review responsibilities and personnel assignments.
 - 4. Attendees: City, Construction Manager, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 5. Agenda: Discuss items of significance that could affect progress, including:
 - a. Web-based construction management system set up and use.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for requests for interpretations (RFIs).
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. City's occupancy requirements.

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

- o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
6. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer and Construction Manager of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related requests for interpretations (RFIs).
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.

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3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded.
6. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings:

1. Conduct progress meetings at weekly intervals.
2. Coordinate dates of meetings with preparation of payment requests.
3. Attendees: In addition to representatives of City, Construction Manager, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings.
4. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
5. Agenda:
 - a. Review and correct or approve minutes of previous progress meeting.
 - b. Review other items of significance that could affect progress.
 - c. Include topics for discussion as appropriate to status of Project.
 - d. Contractor's Construction Schedule:
 - 1) Review progress since the last meeting.
 - 2) Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule.
 - 3) Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
 - 4) Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 5) Review schedule for next period.
 - e. Review present and future needs of each entity present, including:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

- 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Requests for interpretations (RFIs).
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
6. Minutes: Record the meeting minutes.
 7. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 013119
PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General.

1. Requirements include:

- a. On a periodic basis, during construction, during normal business hours, Contractor's Project Manager, Superintendent and Subcontractor representatives shall hold meetings upon request of Engineer and as required in other sections of the Specifications. Engineer or Construction Manager may invite City representatives and other parties as Engineer and Construction Manager deems appropriate. Contractor will chair the meetings. Contractor will prepare minutes of the meetings for review by the Project Manager. Meeting minutes are processed and stored in Procore. Construction Manager has 5 days from meeting to request revisions or corrections from the meeting minutes distributed at the weekly meeting. The meetings shall include:
 - 1) All meetings shall be held both virtually (Teams or Zoom) and in-person at the job site.
 - 2) Progress Review Meetings: Held weekly, to review work in progress, RFI status, submittal status, schedule status, issues that are current as of meeting and other matters raised by Engineer, Construction Manager or Contractor. Contractor shall be prepared, at such meetings, to propose and commit Contractor to corrective actions and associated timetables for remediation of Contractor-accountability deviations from Contract requirements, if applicable.
 - 3) Miscellaneous Meetings: Held on an as needed basis, as deemed necessary by Engineer, Construction Manager or as proposed by Contractor and accepted by Engineer.
 - 4) Construction Project Schedule Meetings per SECTION 013216 CONSTRUCTION PROGRESS SCHEDULE.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 013123

WEB-BASED CONSTRUCTION MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. The Agency and Contractor shall utilize Orion, a Web-based building project management software, for electronic submittal of all data and throughout the duration of the Contract. When required by the Agency's Representative, paper documents will also be provided (e.g., the signature of Contract Modifications and submission of Contract Claims). In the event of discrepancy between the electronic version and paper documents, the paper documents will govern.
- B. Contractor shall include all costs associated with using this software, including user training, in the Contract bid price. The Agency will provide user profiles to the Contractor.
- C. Orion is a registered trademark of Orion Technologies, Inc. Microsoft, Internet Explorer, Outlook, Word, and Excel are registered trademarks of Microsoft Corporation in the U.S.A. Adobe and Acrobat are registered trademarks of Adobe Systems Incorporated.

1.02 USER ACCESS LIMITATIONS

- A. The Agency's Representative will control the Contractor's access to Orion by allowing access and assigning user profiles only to accepted personnel. User profiles will define levels of access into the system; determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do). Subcontractors and suppliers may not have direct access to Orion.

1.03 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

- A. Review comments made (or lack thereof) by the Agency on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. Agency acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

SECTION 013123 – WEB-BASED CONSTRUCTION MANAGEMENT

1.04 SUBMITTALS

- A. Agency Representative's approval is required for most submittals except submittals for information only.

1.05 COMPUTER REQUIREMENTS

- A. The Contractor shall use computer hardware and software that meets the requirements of the Orion system.
- B. System Requirements:
 1. Operating System: Windows 7 or later and Mac X or later.
 2. Internet Browser: Google Chrome recommended.
 3. Screen Resolution: Minimum 1024 x 768 (Recommended horizontal resolution: 1280 or higher.
 4. Minimum Recommended Connection Speed: 30Mbps or above.
 5. Processor Speed: 1 G and above.
 6. RAM: 1G and above.
 7. Recommendation of 32GB of free storage when using Orion app on mobile devices.

1.06 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall be responsible for the validity of the information it places in Orion and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Explorer, e-mail programs such as Outlook, word processing programs such as Word, spreadsheet programs such as Excel, and Adobe Portable Document Format (PDF) document distribution program. The Contractor shall utilize the existing forms in Orion to the maximum extent possible. If a form does not exist in Orion and the Contractor must include as an attachment or by uploading the data file, PDF documents will be created through electronic conversion rather than optically scanned.
- B. The Contractor is responsible for the training of their personnel in the use of Orion as needed. All costs associated with the use of this system, will be evenly distributed in the project overheads and spread across the duration of the contract; a separate cost line item will not be allowed. Orion training is available at education.Orion.com Contractor shall provide completed training certificates for each assigned profile requested.

1.07 CONNECTIVITY PROBLEMS

- A. Orion is a web-based environment and therefore subject to the inherent speed and connectivity problems of the Internet. The Contractor is responsible for its

SECTION 013123 – WEB-BASED CONSTRUCTION MANAGEMENT

own connectivity to the Internet. Orion response time is dependent on the Contractor's equipment, including processor speed, modem speed, Internet access speed, etc. and current traffic on the Internet. The Agency will not be liable for any delays associated with the use of Orion including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. Under no circumstances shall the use of the Orion be grounds for a time extension or cost adjustment to the contract.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 UTILIZATION

- A. Orion shall be utilized in connection with submittal preparation and information management required by Section 013300, SUBMITTAL PROCEDURES, and other Division 01 Sections. Requirements of this Section are in addition to requirements of all other sections of the specifications.
1. Design Document Submittals:
 - a. Provide all design drawings and specifications in file formats specified in other sections of the contract documents.
 2. Shop Drawings:
 - a. Shop drawing and design data documents shall be submitted as PDF attachments to the Orion submittal workflow process and form. All PDF shop drawing submittal documents shall have the Contractor's review and submittal stamp (including signatures) as specified in Section 013300, SUBMITTAL PROCEDURES.
 - 1) Standard manufacturer installation drawings.
 - 2) Drawings prepared to illustrate portions of the work designed or developed by the Contractor.
 - 3) Coordination and Clash Detection Drawings
 - 4) Steel fabrication, piece, and erection drawings.
 3. Product Data:
 - a. Product catalog data and manufacturer's instructions shall be submitted as PDF attachments to the Orion submittal workflow process and form. All PDF product data submittal documents shall have the Contractor's review and submittal stamp (including signatures) as specified in Section 013301, SUBMITTAL PROCEDURES. Examples of product data include, but are not limited to:
 - 1) Manufacturer's printed literature.
 - 2) Preprinted product specification data and installation instructions.

SECTION 013123 – WEB-BASED CONSTRUCTION MANAGEMENT

4. Samples:
 - a. Sample submittals shall be physically submitted as specified in Section 013300, SUBMITTAL PROCEDURES. Contractor shall enter submittal data information into Orion with a copy of the transmittal form(s) attached to the submittal. Examples of samples include, but are not limited to:
 - 1) Product finishes and color selection samples.
 - 2) Product finishes and color verification samples.
 - 3) Finish/color boards.
 - 4) Physical samples of materials.
5. Administrative Submittals:
 - a. All correspondence and Preconstruction submittals shall be submitted on Orion. Examples of administrative submittals include, but are not limited to:
 - 1) List of contact personnel.
 - 2) Requests for Information (RFI).
 - 3) Construction Schedules and associated reports and updates.
 - 4) Submittal Register:
 - 5) Plans for safety, infection control, demolition, environmental protection, and similar activities.
 - 6) Quality Control Plan(s), Testing Plan and Log, Quality Control Reports, Production Reports, Quality Control Specialist Reports, Preparatory Phase Checklist, Initial Phase Checklist, Field Test reports, Summary reports, Rework Items List, etc.
 - 7) Meeting minutes.
 - 8) Any general correspondence submitted.
6. Compliance Submittals:
 - a. Test report, certificate, and manufacture field report submittals shall be submitted on Orion as PDF attachments. Examples of compliance submittals include, but are not limited to:
 - 1) Field test reports.
 - 2) Quality Control certifications.
 - 3) Manufacturer's documentation and certifications for quality of products and materials provided.
7. Record and Closeout Submittals:
 - a. Operation and maintenance data and closeout submittals shall be submitted on Orion as PDF documents during the approval and review stage as specified, with actual set of documents submitted for final. Examples of record submittals include, but are not limited to:
 - 1) Operation and Maintenance Manuals: Final documents shall be submitted as specified.
 - 2) As-built Drawings: Final documents shall be submitted as specified.
 - 3) Extra Materials, Spare Stock, etc.: Submittal forms shall indicate when actual materials are submitted.

SECTION 013123 – WEB-BASED CONSTRUCTION MANAGEMENT

8. Exceptions:
 - a. Documents with legal consequences, contract modifications, contract claims, security implications, and those required by other agencies may require an additional submittal as original hard copy with original signatures and seals. Hard copies of these documents shall be submitted as specified or as directed by the Agency's Representative.

END OF SECTION

SECTION 013216

CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work.
- B. Refer to General Conditions and Agreement, for definitions and specific dates of Contract Time.

1.03 DESCRIPTION

- A. Requirements for CPM scheduling are included to ensure adequate planning and execution of the Work and to assist the Owner in evaluating progress of the Work economically and chronologically.
- B. The Contractor shall be solely responsible for establishing the schedule for the Work and shall be responsible for such schedule to be consistent with meeting the contract milestone, intermediate milestones, and completion dates as established by the Owner.
 - 1. The Contractor shall develop a Critical Path Method Schedule demonstrating fulfillment of all contract requirements. The project schedule shall be kept current to be utilized for scheduling, coordinating, monitoring work progress, and for preparation of the monthly payment application for payment under this Contract including all Work of Subcontractors and equipment and material suppliers.
 - 2. Schedule shall include activities pertaining to long lead delivery items, fabrication items and submittal of shop drawings and product samples.
- C. Contractor shall designate a scheduler who is trained and experienced in compiling construction scheduling data, in analyzing scheduling data by use of CPM, and in the preparation and issuance of periodic reports as required herein. The Contractor's Scheduling Representative shall have direct control and

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

complete authority to act on behalf of the Contractor in fulfilling all project schedule requirements.

1.04 QUALITY ASSURANCE

- A. The following publication is cited as reference for CPM and scheduling techniques utilized in this Contract:
 - 1. J.J. Moder & C.R. Phillips, Project Management with CPM & Pert., New York: Reinhold Publishing Corp.
- B. All schedule and report work shall use a computer-based CPM, compatible with Primavera P6 or Suretrak Project Manager 3.0b version 2 or newer and shall be compatible with Windows 10 or newer operating system.
- C. All schedule submittals shall include a minimum of one print and an electronic backup of the current schedule. Regardless of the software used, all schedules shall be provided as a P3 backup, PRX file type.

1.05 INTERIM SCHEDULE

- A. Pre-Construction Scheduling Conference: The Contractor and Owner's Representative Construction Manager (CM) shall conduct a pre-construction scheduling conference with the Contractor's Project Manager and Construction Scheduler within five calendar days of the Notice to Proceed.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. Contractor shall submit the alphanumeric coding structure and the activity identification system for labeling the work activities.

The Engineer will review the logic diagram, coding structure, and activity identification system, and provide required baseline schedule changes to the Contractor for implementation.

- B. Within 10 calendar days after Notice to Proceed and prior to submission of the first payment request, the Contractor shall submit to the Owner a practical 90 calendar day Interim Schedule – two hard copies and an electronic copy. The Interim Schedule shall reflect the following information:
 - 1. Procurement, submittals, construction drawings, shop drawings, approvals, fabrication and delivery of all major and long lead equipment and material items.
 - 2. Work expected to occur within the first 90 calendar days of the project, consistent with meeting all established milestone and completion dates.

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

3. The Interim Schedule shall be descriptive of the work to be performed so that the Contractor, Owner, and CM can easily monitor progress of the work. All work activities shall be cost loaded and will be the basis for payment during the beginning months of the project. All activities shall be coded to align with the approved Schedule of Values. No Activities are to be started until the Engineer has accepted the Interim Schedule, at which time it will be updated monthly until such time as the Official Contract Schedule is accepted.
- C. Within 15 calendar days after receipt of the Interim Schedule, the Owner will notify the Contractor of the approval or disapproval of the Interim Schedule. In the event of disapproval, the Contractor shall resubmit the schedule within seven calendar days. No progress payments will be made for work in progress or completed until the Interim Schedule is approved.

1.06 OFFICIAL CONTRACT SCHEDULE (Baseline Schedule)

- A. The Critical Path Method Schedule to be prepared by the Contractor pursuant to this section will be a part of a total system for scheduling, reporting work progress, and preparing the monthly payment application.
1. Within 40 calendar days after the Notice to Proceed, the Contractor shall submit to the Engineer four original prints of the complete project schedule, and an electronic copy, for approval or disapproval. In the event the complete project schedule is disapproved, the Contractor shall resubmit a corrected schedule within 15 calendar days after the notice of disapproval is received by the Contractor.
 2. Should the Contract Schedule not be accepted within 90 calendar days after Notice to Proceed, the Contractor may be due provisional progress payments(s) on work performed, based on the Interim Schedule. It is the responsibility of the Contractor to reconcile such cost information and payments with the Contract Schedule. However, no payment shall be approved after the 90 calendar-day period, until the Contract Schedule has been accepted by the Owner.
 3. All activities in the Official Contract Schedule shall have sufficient code structure to enable a sort by activity code, or "rollup" of the activities in the form of a Summary Schedule. The code structure will allow sufficient sorting capabilities to group by responsibility (by subcontractor), location (building, floor, area, etc.), type (submittal, approval, change, etc), milestones, CSI division, etc.
 4. The approved Interim Schedule shall be incorporated into the final Contract Schedule and shall represent the initial 90 calendar days of the Contract Schedule.
 5. The Official Contract Schedule shall be a cost, and manpower resource-loaded CPM schedule. Mobilization, bond, and insurance costs shall be shown separately; however, other general requirement costs, overhead, profit, etc., shall be prorated throughout all the activities. The cost-loaded

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activities of the Initial Contract Schedule shall be from the Schedule of Values line items and shall be basis for establishing the distribution of costs within the Schedule of Values. Costs relating to each activity shall be distributed evenly over the duration of the activity.

6. The initial submittal of the Contract Schedule shall not reflect contract changes or delays. These changes shall be added within the first Schedule Revision.
7. The initial submittal of the Official Contract Schedule shall include, in addition to construction activities, the following:
 - a. The submittal and approval of construction drawings, shop drawings and materials, the procurement, fabrication, delivery, and testing of major materials and equipment, and their installation and testing.
 - b. Contract requirement dates of all or parts of the Work will be shown including all activities of the Owner that affect the progress of the work.
 - c. Activities of completed work ready for use by next trade, etc.
 - d. Activities relating to different areas of responsibility, such as sub-contracted Work which is distinctly separate from that being done by Contractor directly.
 - e. Different categories of Work as distinguished by craft or crew requirements.
 - f. Different categories of Work as distinguished by materials.
 - g. Distinct and identifiable subdivisions of Work such as structural slabs, beams, or columns.
 - h. Location of Work within the project that necessitates different times or crew to perform.
 - i. Outage schedules of limiting times that existing utility services may be interrupted to construct the Project.
 - j. Items listed separately in Schedule of Values for payment purposes. All activities shall be coded to align with the approved Schedule of Values.
 - k. Acquisition and installation of equipment and materials supplied and/or installed by Owner or separate Contractors.
 - l. Material stored on site.
8. Major Equipment/Materials: For all major equipment and materials fabricated or supplied for Project, Construction Schedule shall show a sequence of activities including:
 - a. Preparation of shop drawings and sample submissions.
 - b. Time required to obtain special inspection certifications and additional permits or certifications that may be required for specific tasks and/or systems (i.e., elevator variance).
 - c. Review of shop drawings and samples.
 - d. Shop fabrication, delivery, and storage.
 - e. Erection or installation.
 - f. Test of equipment and materials.
 - g. Required dates of completion.

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9. Early Completion: Include in Construction Schedule an early completion date for the Project that is no earlier than Project's required date of completion.
10. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
11. Construction activities are to be delineated separately for off-site sewer, site development, earthwork, utilities, and like Work separately.
12. The time-scaled logic diagrams shall clearly indicate any work that is planned to be accomplished on a work schedule other than 8 hours per day and 40 hours per week.
13. The CPM schedule shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation(s). The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.
14. The basic concept of CPM time-scaled logic diagramming will be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities. The diagrams shall show a continuous flow from left to right with no right to left sequences. The CPM schedule shall be based on early start and early finish dates of activities, and clearly show the primary paths of criticality using time scaled logic graphical presentation.
15. Schedules shall have not less than 500 activities, unless otherwise authorized by the Owner Project Manager. The number of activities shall be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts. Schedule activities shall include the following:
 - a. A clear and legible description.
 - b. Start and finish dates
 - c. A duration of not less than one working day, except for event activities, nor more than 10 working days in duration, except for passive activities such as concrete curing, or as otherwise authorized by the Engineer, for any operation. All holidays and non-working days shall be identified by way of calendar designations. Refer to General and Supplementary Conditions for recognized Designated Holidays.
 - d. At least one predecessor and one successor is required for each activity, except for the project start and finish milestones.
 - e. All required constraints.
 - f. Codes for responsibility, stage, work shifts, location, and contract pay items.
16. All activities shall be linked by realistic logical relationships only. Other type of relationships shall be permitted but shall be minimized (including, but not limited to: start-to-start, finish-to-finish, and start-to-finish relationships). The Engineer will reject any schedule utilizing unrealistic or meaningless logic.

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Constraints on activities shall be kept to a minimum and subject to the written permission of the Engineer. Lags will not be used without the prior written permission of the Owner.

17. The Official Contract Schedule shall include the entire scope of work and show how the Contractor plans to complete the work. The schedule shall show the activities that define the critical path. Multiple critical paths will not be accepted. A total of no more than 25 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer. Near critical is defined as float less than 10 days.
18. The Official Contract Schedule shall not extend beyond the number of calendar days specified in the Contract. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule shall not attribute negative float or negative lag to any activity.
19. The following information will be provided in a report for each network activity:
 - a. Data Date
 - b. Activity number and description.
 - c. Activity duration in work days.
 - d. Activity cost. The Contract Price shall be broken down with the appropriate values distributed to the network diagram activities, coded to align with the approved Schedule of Values.
 - e. Working activities and General Conditions activities shall be identified separately.
 - f. Activity predecessors and successors.
 - g. Activity codes
 - h. Activity logic ties.
 - i. Scheduled, or actual and remaining durations (work days) for each activity.
 - j. Earliest Start and Earliest Finish Dates (calendar).
 - k. Actual Start and Actual Finish Dates (calendar).
 - l. Latest Start and Latest Finish Dates (calendar).
 - m. Free Float and Total Float (work days)
 - n. Percentage of activity complete and remaining duration for incomplete activities.
 - o. Lags.
 - p. Required Constraints.
20. The Contractor shall provide to the Engineer his schedule data together with associated costs. Schedule information provided by the Contractor shall support completion dates of the contract and the sum of the network activity costs shall equal the total contract price.
21. Schedule review by the Owner and its agents is limited to ensuring the logic of sequencing is reasonable and Contractor has demonstrated ability to meet contractual milestone and completion dates. Acceptance of schedule should not be construed as direction from the Owner to Contractor on how to schedule the work.

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22. Subsequent to acceptance of the contract (baseline) schedule, the Contractor will provide electronic copies of the network diagrams and supporting documents. Monthly update data will be submitted in the same form and numbers.
23. After Completion and Acceptance of the Official Contract Schedule: The Contractor will provide initial computer reports and weekly and monthly reports thereafter, as follows:

1.07 UPDATE SCHEDULES

- A. The Contractor shall submit an Update Schedule – electronic copy – and meet with the Engineer to review progress, before the first day of each month, beginning one month after the Baseline Schedule is accepted. The Contractor shall allow 2 weeks for the Engineer to review after the update schedule and all supporting data are provided, except that the review period shall not start until the previous month's required schedule is accepted.
 1. The Update Schedule shall have a data date of the end of the month or other date established by the Engineer. The update schedule shall show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percentage complete, and finish dates shall be shown. Actual Durations for work that has been completed shall be shown on the Update Schedules for when the work actually occurred, including submittal reviews and contractor re-submittal times.
 2. The Contractor may include modifications such as adding or deleting activities or changing activity constraints, durations, or logic that do not: (1) alter the critical path(s) or near critical path(s), or (2) extend the schedule completion date compared to that shown on the current accepted schedule. The Contractor shall provide a narrative in writing that states the reasons for any changes to the planned work. If any propose changes in planned work will result in (1) or (2) above, then Contractor shall submit a time impact analysis as described herein.
 3. Any request for an adjustment of the Contract Time for completion submitted by Contractor for changes or alleged delays shall be accompanied by a complete Time Impact Analysis, (TIA), which shall be submitted for review within 15 days after the initial request for time by Contractor, or the impacting incident, whichever comes first.
 4. Schedule Reports: Initial and subsequent Update Schedule Reports will contain the following minimum information for each activity and shall be produced at a minimum of once a month:
 - a. Data date.
 - b. Activity Number and description.
 - c. Predecessor and successor activity numbers and descriptions.
 - d. Activity codes.
 - e. Scheduled, or actual and remaining durations for each activity.
 - f. Earliest start and finish (calendar) dates.

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- g. Actual start and finish (calendar) dates.
 - h. Latest start and finish (calendar) dates.
 - i. Free and total float (workdays).
 - j. Percentage of each activity completed and remaining duration for incomplete activities as of each report.
 - k. Remaining float/days behind schedule.
 - l. Responsibility for activity.
 - m. Current status of activity as compared to baseline schedule.
5. Cost Reports: Initial and subsequent update Cost Reports will include the following information for each activity, sorted by trade activity:
- a. Activity Number and description.
 - b. Activities coded to approved Schedule of Values.
 - c. Percentage of value of Work in place against total value.
 - d. Total cost of each activity.
 - e. Value of Work in place since last report.
 - f. Value of Work in place to date.
 - g. Value of incomplete Work.
6. Narrative Reports: Monthly Narrative Reports shall contain the following information for each monthly update:
- a. Description of overall project status.
 - b. Description of problem areas (referenced to pending change orders as appropriate).
 - c. Current and anticipated delays not resolved by approved change order, including:
 - 1) Cause of the delay.
 - 2) Corrective action and schedule adjustments to correct the delay.
 - 3) Known or potential impact of the delay on other activities and milestones.
 - 4) Changes in the construction sequence.
 - d. Pending items and status thereof, including but not limited to:
 - 1) Pending Change Orders.
 - 2) Time Extension Requests.
 - 3) Other Issues relating to Contract Time.
 - e. Contract Completion Date status:
 - 1) If ahead of schedule, the number of calendar days ahead.
 - 2) If behind schedule, the number of calendar days behind.
7. Three-week Window: Weekly, for the progress meeting, the Contractor shall produce a three-week window of the current schedule, indicating activities scheduled for the current and following 2-week period.
8. Payment Progress Reporting: Owner and Contractor shall select a specified time for updating the Project Schedule at the jobsite each month.
- a. The Owner and Contractor and his/her designated scheduling representatives will attend the meeting to review the project progress.
 - b. The schedule shall be the basis for monthly pay requests derived from the joint review of the cost loaded schedule.

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- c. All progress and status information provided by the Contractor shall clearly define the reporting period for which the status is provided.
9. At the monthly progress review meeting, the Contractor will provide "actual start" and "actual completion" dates for activities that were started or completed during the reporting period. The Contractor and the Engineer will agree upon and assign percent complete values to activities in progress. In the event of a disagreement, the Engineer shall make the final decision as to percent completion of each activity.
10. After joint review, Engineer will process the Contractor's pay request based on progress from the schedule.
 - a. Payment to the Contractor shall be made from the progress reflected by the Interim or the Contract Schedule.
11. Time is of the essence: Whenever it becomes apparent from the current monthly progress review that phases of Work or the Contract Completion Date will not be met, through no fault of the Owner, the Contractor will take the following actions with no change in the contract amount:
 - a. Increase construction manpower to eliminate any adverse backlog of work.
 - b. Increase the number of working hours per shift, shifts per day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the adverse backlog of Work.
12. The Official Contract Schedule as accepted by the Engineer will be an integral part of the Contract and will establish interim Contract Completion Dates or milestone dates for the various activities.
13. Delays of any non-critical Work shall not be the basis for an extension of Contract Time.
14. Float Time. Float is defined as the time that a non-critical Work activity can be delayed or extended without delaying the scheduled completion of milestones specified in this Section or the scheduled completion date of the Work, or both. **Float time is not for the exclusive use or benefit of either Owner or Contractor. Neither Contractor nor Owner shall have an exclusive right to the use of float. Contractor is to document the effect on the updated Contract Schedule whenever float has been used.**
15. Should any activity fall 21 calendar days or more behind the Official Contract Schedule approved by the Owner, the Owner will have the right to order the Contractor to expedite completion of that activity using whatever means are appropriate and necessary, without additional compensation to the Contractor.
16. Should any activity fall 28 or more calendar days behind the Official Contract Schedule approved by the Owner, through no fault of the Owner, the Owner will have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate. All costs incurred by the Owner in connection with expediting such activity under this subparagraph shall be reimbursed promptly to the Owner by the Contractor.
17. It is expressly understood and agreed that the failure by the Owner to either order the Contractor to expedite an activity or to expedite the activity by

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other means, pursuant to the two preceding paragraphs, shall not be considered precedent setting with respect to any other activities which may fall behind the Official Contract Schedule approved by the Owner; nor will it relieve the Contractor from completion of the Project Work in accordance with the Official Contract Schedule and the Contract Completion Date.

18. Owner's acceptance of, or its review of, comments about any schedule or scheduling data shall not relieve the Contractor from its sole responsibility to plan for, perform, and complete the Work within the Contract Time. Acceptance of or review of comments about any schedule shall not transfer responsibility for any schedule to Owner nor imply their agreement with: 1) any assumption upon which such schedule is based, or 2) any matter underlying or contained in such schedule.
19. Failure of Owner to discover errors or omissions in schedules that it has reviewed, or to inform Contractor that Contractor, Subcontractors, or others are behind schedule, or to direct or enforce procedures for complying with the Contract Schedule shall not relieve Contractor from its sole responsibility to perform and complete the Work within the Contract Time and shall not be a cause for an adjustment of the Contract Time or the Contract Sum.

B. Schedule Revisions:

1. General: Revisions to accepted Construction Schedule must be approved in writing by the Owner and Contractor.
2. Contractor: Submit requests for revision to schedule to the Engineer together with a TIA and a written rationale for revisions and description of logic for re-sequencing Work and maintaining Specific Contractual Milestone Dates listed in Contract Documents.
3. Proposed revisions acceptable to Owner may then be incorporated into next update of Construction Schedule following the review and acceptance.
4. Acceptance: Acceptance of revised schedule by Owner does not relieve Contractor of meeting contractual milestone and completion dates.

C. Time Impact Analysis:

1. The Contractor shall submit a written TIA – hard copy and electronic – to the Owner Project Manager with each request for adjustment of contract time, or when the Contractor or Owner Project Manager consider that an approved or anticipated change may impact the critical path or contract progress.
2. The TIA shall illustrate the impacts of each change or delay on the current schedule completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

schedule shows that incorporating the event modifies the critical path and scheduled completion date of the Official Contract Schedule, the difference between scheduled completion dates of the two schedules shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

3. The Contractor shall submit a TIA in duplicate within seven calendar days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 14 calendar days after receipt to accept or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.
4. If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 21 calendar days from the meeting to give notice of potential claim, as noted in GENERAL PROVISIONS Section 6-11. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 21 calendar days. The schedule item payment will resume on the next payment application after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

1.08 RECOVERY SCHEDULE

- A. General: Should updated Construction Schedule show Contractor to be 15 or more calendar days behind schedule at any time during construction, Contractor will prepare Recovery Schedule displayed on CPM schedule, at no additional costs to Owner. Prepare Recovery Schedule to show plan for returning to original schedule as expeditiously as possible, and in a manner that complies with paragraph 1.07, Update Schedules, requirements.
- B. Schedule Preparation: Within three calendar days after notice from Engineer, prepare and submit to Engineer a Recovery Schedule, incorporating best available information from Subcontractors and others which will permit return to Construction Schedule at earliest possible time. Prepare Recovery Schedule to same level of detail as Construction Schedule and for maximum duration of 1 month.
- C. Schedule Review: Within seven calendar days after notice from Owner, participate in conference with Owner and Engineer to review and evaluate Recovery Schedule. Submit revisions necessitated by review for Owner's acceptance within four calendar days of conference. Use accepted Recovery Schedule for its planned duration as basis for return to Construction Schedule.

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- D. Schedule Assessment: Seven days prior to expiration of Recovery Schedule, confer with Engineer to assess effectiveness of Recovery Schedule. As a result of this conference, Engineer will direct Contractor as follows:
1. Behind Schedule: If Engineer determines Contractor is still behind schedule, Engineer will direct Contractor to prepare another Recovery Schedule for subsequent pay period.
 2. On Schedule: If Owner' Construction Manager determines Contractor has successfully complied with provisions of Recovery Schedule, Engineer will direct Contractor to return to use of Construction Schedule.

1.09 FINAL UPDATE SCHEDULE

- A. The Contractor shall submit a final as-built schedule with actual start and finish dates for the activities, within 30 calendar days after completion of the contract work. The Contractor shall provide a written statement with this submittal signed by the Contractor's Project Manager and an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the statement to a responsible manager.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work includes:
 - 1. Furnish all submittals for work as indicated in accordance with provisions of Contract Documents.
 - 2. Submittals include the following items:
 - a. Shop drawings.
 - b. Product data.
 - c. Samples.
 - d. Project information.
 - e. CALGreen documentation.
 - f. LEED documentation
 - g. Schedule of Submittals: Prior to first application for payment.
 - h. Completely coordinate with all Contract work.

1.02 DEFINITIONS

- A. Shop drawing submittals are drawings, diagrams, schedules and other data specially prepared for Work by Contractor, manufacturer, supplier or distributor to illustrate some portion of Work.
- B. Product data submittals are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, test data and other information furnished by Contractor to illustrate material, product, or system for some portion of Work.
- C. Sample submittals are physical examples which illustrate materials, equipment or workmanship and propose standards by which Work will be judged.
 - 1. Samples also include job site mockups.
- D. Project Information submittals are items pertaining to quality control and Agency information which may not require review or response by Engineer and are to be retained for project file only.
 - 1. Examples:
 - a. Test reports.
 - b. Certifications.
 - c. Design calculations.
 - d. Installation instructions.

SECTION 013300 – SUBMITTAL PROCEDURES

- E. Shop Drawings, Product Data, Samples, and similar submittals are for those portions of Work for which submittals are required and shall indicate the way the Contractor proposes to conform to information given and the design concept expressed in Contract Documents.

1.03 TRANSMITTAL – GENERAL

- A. Submit all items to Engineer, or person or entity to whom Engineer has delegated this function in writing. All submittals shall be delivered per the requirements of Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT, of these Special Provisions.
- B. Contractor is responsible for making submissions.
 - 1. Submit to address indicated by Agency.
 - 2. Each transmittal to include items from one specification section only.
- C. Make submittals sufficiently in advance of date required to allow Engineer reasonable time for review, and resubmission if necessary.
 - 1. Schedule submittals requiring Engineer color selection within 30 days following award of contract.
 - 2. Items not submitted in accordance with provisions of this section will be returned, without action, for resubmission by Contractor.

1.04 SHOP DRAWINGS AND PRODUCT DATA

- A. Shop drawing and product data submittals are required as called for by specification section submittal paragraph, or by additional requirements of the respective sections.
- B. Identify drawings with manufacturer, item, use, type, project designation, specification section or drawing detail reference.
- C. Submit each shop drawing per the provisions of Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT.
 - 1. Create drawings not smaller than 24 inches x 36 inches or not larger than 30 inches x 42 inches.
 - 2. Allow a clear space, approximately 6 x 6 inches, for notations on right hand side of each sheet.
- D. Submit product data items such as equipment brochures, cuts of fixtures, or standard catalog items per the provisions of Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT.
 - 1. Indicate exact item or model and proposed options.
 - 2. Include scale details, sizes, dimensions, performance characteristics, capacities, wiring diagrams, controls, and other pertinent data.

SECTION 013300 – SUBMITTAL PROCEDURES

1.05 SAMPLES

- A. Sample submittals are required as called for by specification section submittal paragraph.
- B. Identify samples with manufacturer's name, item, use, type, project designation, specification section or drawing detail reference, color, range, texture, finish and other pertinent data.
- C. Engineer may, at his option, retain samples for comparison purposes.
- D. Field Mockups: Fabricate on site in accordance with specification section requiring them.

1.06 PROJECT INFORMATION

- A. Submit project information as called for by specification section submittal paragraph.
- B. Submit project information items per the provisions of Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT.
 - 1. Include pertinent data.
- C. Project information:
 - 1. Engineer may review at its sole discretion project information for compliance with Contract Documents only.
 - 2. Review will not constitute a detailed check of submitted design calculations.
 - 3. Appropriateness and accuracy of calculations is responsibility of Contractor (and Contractor's professional engineer when such calculations are required to be professionally sealed).
 - 4. When professional or other certification of performance criteria of materials, systems or equipment is required by Contract Documents, Engineer shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

1.07 CONTRACTOR ACTION

- A. Review, approve, stamp, and sign items prior to submission to Engineer.
- B. Stamp indicates Contractor has:
 - 1. Verified field dimensions and quantities.
 - 2. Verified field construction criteria, materials, catalog numbers and similar data.
 - 3. Reviewed and coordinated submittal data with requirements of Work and Contract Documents.
 - 4. Certified that submittals comply with Contract Documents.

SECTION 013300 – SUBMITTAL PROCEDURES

- C. Reproduce and distribute submittals to Contractor's organization, including Subcontractors/vendors and to Agency in specified number of copies or additional copies as necessary to support execution of the Work.
- D. Resubmit items stamped "revise and resubmit" or "rejected" until approval is received.
 - 1. Contractor shall, if applicable, add letter suffix to previous transmittal number, to indicate resubmission, for example 03450A-1A.
 - 2. Contractor shall direct specific attention, in writing, on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by Engineer on previous submittals.
- E. Contractor shall direct specific attention, in writing or on Shop Drawings, Product Data or Samples, to deviations from Contract Documents.
 - 1. Contractor shall not be relieved of responsibility for deviation from requirements of Contract Documents by Engineer's approval of Shop Drawings, Product Data and Samples unless Contractor has specifically informed Engineer in writing of such deviation at time of submission and Engineer has given written approval to each specific deviation. Such deviations shall require Agency's agreement unless it is considered a minor change in Work and does not involve adjustment in Contract Sum or Contract Time.
- F. Contractor shall not be relieved from responsibility for errors or omissions in Shop Drawings, Product Data or Samples by Engineer's approval thereof.
- G. Contractor is responsible for confirmation and correlation of dimensions at job site; for information that pertains solely to fabrication processes or to techniques of construction; and for coordination of work of all trades.
- H. Completed work shall strictly conform to approved samples.
- I. Do not start work which requires submittals, prior to return of submittals with Engineer's stamp indicating approval.

1.08 SCHEDULE

- A. Within 30 days following Notice to Proceed, submit to Engineer a complete schedule of required submittals indicating proposed submittal dates for items in format acceptable to Engineer.
- B. Include submittal number as described in paragraph 1.10, Submittal Transmittal Form, below.
- C. Furnish all submittals to Engineer, for entire Contract, per the schedule indicated in Paragraph A above.

SECTION 013300 – SUBMITTAL PROCEDURES

1.09 ENGINEER REVIEW: SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Review is only for conformance with design concept of project and compliance with intent of information given in Contract Documents.
- B. Engineer shall stamp submittals indicating action taken.
- C. Engineer's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by Engineer, of any construction means, methods, techniques, sequences, or procedures.
- D. Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

1.10 SUBMITTAL TRANSMITTAL FORM

- A. Submittals shall be submitted on Procore as PDF attachments. See Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 013542

CALGREEN REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. This Section includes general requirements and procedures for compliance with 2019 CALGreen nonresidential mandatory requirements.
- C. Related Sections:
 - 1. Divisions 01 through 48 Sections, as applicable, for CALGreen requirements specific to the work of each of those Sections
 - 2. Section 018113, SUSTAINABLE DESIGN REQUIREMENTS, for additional sustainable design elements required for the project.
 - 3. Section 019113, COMMISSIONING REQUIREMENTS, for commission requirements necessary for CALGreen and LEED documentation.

1.02 SUBMITTALS

- A. CALGreen submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CALGreen requirements.
- B. Contractor shall develop a spreadsheet or use one furnished by the Engineer or building department to track submittals required by CALGreen.
- C. CALGreen Submittals:
 - 1. Furnish documentation showing verification of CALGreen compliance as required by enforcing agency.
 - 2. Section 5.106.1 – Storm Water Loss Prevention Plan: Newly constructed projects and additions which disturb less than one acre of land shall prevent the pollution of stormwater runoff from the construction activities through one or more of the following measures:
 - a. Local ordinance, 5.106.1.2.
 - b. Best management practices (BMP) complying with Section 5.106.1.2.

SECTION 013542 – CALGREEN REQUIREMENTS

3. Section 5.106.10 – Grading and Paving: Furnish drawing showing grading and paving designed to keep surface water from entering buildings.
4. Section 5.408.2 – Construction Waste Management Plan: Furnish a construction waste management plan complying with specified requirements.
5. Section 5.504.4.5 – Composite Wood Products: Furnish documentation showing compliance with Section 5.504.4.5.
6. Section 5.504.5.6 – Resilient Flooring: Furnish documentation showing resilient flooring materials meet the pollutant emission limits.

1.03 SUMMARY OF CALGREEN REQUIREMENTS

- A. Division 5.1 – Planning and Design:
 1. Site Development Requirements: Comply with the applicable requirements of Section 5.106.
 - a. Section 5.106.1 – Storm Water Pollution Program: Newly constructed projects and additions which disturb less than one acre of land shall prevent the pollution of stormwater runoff from the construction activities through one or more of the following measures:
 - 1) Local ordinance, 5.106.1.2.
 - 2) Best management practices (BMP) complying with Section 5.106.1.2.
 - b. Section 5.106.4 – Bicycle Parking: Comply with Section 5.106.4.1 or 5.106.4.2, as applicable, for short-term and long-term bicycle parking.
 - c. Section 5.106.5.2 – Designated Parking: Comply with Section 5.106.5.2 for designated parking for low-emitting, fuel-efficient and carpool/van pool vehicles.
 - d. Section 5.106.8 – Light Pollution Reduction: Comply with Section 5.106.8.1 for outdoor lighting systems.
 - e. Section 5.106.10 – Grading and Paving: Construction and grading plans shall comply with Section 5.106.10.
- B. Division 5.3 – Water Efficiency and Conservation:
 1. Section 5.303 – Indoor Water Use: Comply with the applicable requirements of Section 5.303 and Table 5.303.2.2 for Indoor Water Use Baseline.
 2. Section 5.304 – Outdoor Water Use: Comply with the applicable requirements of Section 5.304.
- C. Division 5.4 – Material Conservation and Resource Efficiency:
 1. Section 5.407 – Water Resistance and Moisture Management: Comply with requirements specified in Section 5.407 for Weather Protection and Moisture Control.
 2. Section 5.408 – Construction Waste Reduction, Disposal and Recycling: Comply with requirements specified in Section 5.408.
 - a. Recycled and/or salvage for reuse a minimum of 50-percent of the nonhazardous construction and demolition waste or meet a local

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- construction and demolition waste management ordinance, whichever is more stringent.
- b. Where the local jurisdiction does not have a construction and demolition waste management ordinance, submit a construction waste management plan with the following:
 - 1) Identify the materials to be diverted from disposal by efficient usage, recycling, reuse on the Project or salvage for future use or sale.
 - 2) Determine if materials will be sorted on-site or mixed.
 - 3) Identify diversion facilities where material collected will be taken.
 - 4) Indicate the amount of materials diverted, calculated by weight or volume, but not by both.
 - c. Utilize a waste management company that can provide verifiable documentation that the percentage of construction and demolition waste material diverted from the landfill complies with Section 5.408.1.2.
 - d. The combined weight of new construction disposal that does not exceed 2 pounds per square foot (psf) of building area may be deemed to meet the 50 percent minimum requirement.
 - e. Documentation shall be provided to the enforcing agency which demonstrated compliance with Section 5.408.1 thru 5.408.1.3. The waste management plan shall be updated as required and shall be accessible during construction for examination by the enforcing agency.
 - f. 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled.
3. Section 5.410 – Building Maintenance and Operation: Comply with the requirements specified in Section 5.410.
- a. Provide readily accessible areas that serve the entire building and are identified for the depositing, storage and collection of non-hazardous materials for recycling, including paper, corrugated cardboard, glass, plastics and metals.
 - b. For new buildings of 10,000 square feet or more, comply with the commissioning requirements specified in Section 5.410.2. Commissioning shall be performed by trained personnel with experience on projects of comparable size and complexity. General commissioning requirements include the following. The specific requirements of each item are specified in Section 5.410.2.1 thru 5.410.2.6.
 - 1) Owner's or Owner Representative's project requirements.
 - 2) Basis of design.
 - 3) Commissioning measures shown in the Construction Documents.
 - 4) Commissioning plan.
 - 5) Functional performance testing.
 - 6) Documentation and training.

SECTION 013542 – CALGREEN REQUIREMENTS

- 7) Commissioning report.
 - c. For new buildings less than 10,000 square feet, test and adjust systems as specified in Sections 5.410.4.2 thru 5.410.4.5.
- D. Division 5.5 – Environmental Quality:
 - 1. Section 5.504 – Pollutant Control: Comply with the requirements specified in Section 5.504.
 - a. The permanent HVAC system shall only be used during construction if necessary to condition the building or areas of addition or alteration within the required temperature range for material and equipment installation. If the HVAC system is used during construction, use return air filters with a minimum MERV of 8.
 - b. Cover duct openings and protect mechanical equipment during construction as specified in Section 5.504.3.
 - c. Finish materials shall comply with the requirement specified in Sections
 - d. Sections 5.504.4.1 thru 5.504.4.4, as follows:
 - 1) Adhesives, adhesive bonding primers, adhesive primers and caulks shall meet the following requirements:
 - a) Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable or SCAQMD Rule 1168 VOC limits as shown in Tables 5.504.4.1 and 5.504.2.
 - b) Aerosol adhesives and smaller unit sizes of adhesives, and sealant or caulking compounds shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of CCR Title 17, commencing with Section 94507.
 - 2) Architectural paints and coatings shall comply with VOC limits in Table 1 of the ARB Architectural Coatings Suggested Control Measure, as shown in Table 5.504.4.3 unless more stringent local limits apply.
 - a) Aerosol paints and coatings shall meet the PWMIR Limits for ROC in Section 94522(a)(3) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances, in Sections 94522(c)(2) and (d)(2) of CCR, Title 17, commencing with Section 94520 and in areas under the jurisdiction of the SCAQMD additionally comply with the percent VOC by weight of product limits.
 - 3) Carpet shall meet the testing and product requirements of one of the following, as required by Section 5.504.4.4:
 - a) Carpet and Rug Institute's Green Label Plus Program.
 - b) California Department of Public Health Standard Practice for the testing of VOCs (Specification 01350).

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- c) NSF/ANSI 140 at the Gold level.
 - d) Scientific Certifications Systems Sustainable Choice.
 - 4) Carpet cushion shall meet the requirements of the Carpet and Rug Institute Green Label program.
 - 5) Carpet adhesive shall meet the requirements of Table 5.504.4.1.
 - 6) Composite wood products, including hardwood plywood, particleboard and medium density fiberboard, used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood (17 CCR 93120 et seq.) by or before the dates specified in those sections, as shown in Table 5.504.4.5.
 - 7) For 80 percent of floor area receiving resilient flooring, installed resilient flooring shall meet at least one of the following:
 - a) Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.
 - b) Compliant with the VOC emission limits and testing requirements specified in the California Department of Public Health's 2010 Standard Method for the Testing and Evaluation Chambers, Version 1.1, February 2010.
 - e. Provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 8 as specified in Section 5.504.5.3.
 - f. Where outdoor areas are provided for smoking, prohibit smoking within 25 feet of building entries, outdoor air intakes and operable windows and in buildings; or as enforced by ordinances, regulations or policies of any city or county, whichever are more stringent. Post signage to inform building occupants of the prohibitions.
 - 2. Indoor Moisture Control: Comply with the requirements specified in Section 5.505.
 - 3. Indoor Air Quality: Comply with the requirements specified in Section 5.506.
 - 4. Environmental Comfort: Comply with the requirements specified in Section 5.507.
 - 5. Outdoor Air Quality: Comply with the requirements specified in Section 5.508.
- E. Summary:
- 1. Certain CALGreen Measures needed to comply with code are dependent on material selections, documentation and means and methods of the work. Each item related to CALGreen may not be specifically identified as CALGreen requirements in this Section. Refer to CALGreen Code, CCR Title 24, Part 11 for complete descriptions of measures and submittal requirements.
 - 2. Designate an on-site field staff person contact for all CALGreen prerequisites and credit documentation, subcontractor supervision and submittal coordination and to manage the Contractor's portions of the CALGreen submittal process.

SECTION 013542 – CALGREEN REQUIREMENTS

3. Documentation for CALGreen Measures shall be submitted in the format required by the CALGreen code.
4. A copy of the CALGreen code, CCR Title 24, Part 11 shall be available on-site at all times.
5. Additional information on CALGreen can be found at <http://www.bsc.ca.gov>.

F. Meetings:

1. Contractor shall conduct CALGreen compliance meetings as required. Contractor personnel who shall attend CALGreen compliance meetings include, but are not limited to:
 - a. Contractor's project manager.
 - b. Owner's Representative.
 - c. Other attendees designated by Owner's Representative.
 - d. Subcontractor representatives as appropriate to stage of work.
2. At a minimum, CALGreen compliance issues shall be discussed at the following meetings:
 - a. Preconstruction meetings.
 - b. Progress meetings.
 - c. Subcontractor meetings.
 - d. Meetings shall be scheduled as part of regularly scheduled job meetings on-site.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Engineer, or authorities having jurisdiction, are not limited by provisions of this Section.

1.03 DEFINITIONS

- A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.

SECTION 014000 – QUALITY REQUIREMENTS

- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and

SECTION 014000 – QUALITY REQUIREMENTS

requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.05 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and re-inspecting.

SECTION 014000 – QUALITY REQUIREMENTS

14. Test Reports shall be signed by a Registered Civil Engineer licensed in the state of California.

- D. Permits, Licenses, and Certificates: For City's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state of California and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

SECTION 014000 – QUALITY REQUIREMENTS

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality assurance service to Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer.
 2. Notify Engineer 7 days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Engineer's approval of mockups before starting work, fabrication, or construction.
 - a. Allow 7 days for initial review and each re-review of each mockup.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

SECTION 014000 – QUALITY REQUIREMENTS

1.07 PAYMENTS

- A. Costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections, will be paid for by the City. Initial tests and inspections are defined as the first tests and inspections as herein specified.
- B. In the event a test of inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for retesting and reinspection will be paid by the City and back-charged to the Contractor.
- C. Additional tests and inspections not herein specified but requested by Engineer, will be paid for by City, unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the City will pay all costs for initial testing as well as retesting and reinspection, and back-charge the Contractor.
- D. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply will be paid for by City and back-charged to the Contractor.
- E. Costs for test or inspections which are required to correct deficiencies will be paid by the City and back-charged to the Contractor.
- F. Cost of testing which is required solely for the convenience of Contractor in his scheduling and performance of work will be paid by the City and back-charged to the Contractor.
- G. Overtime costs for testing and inspections performed outside the regular workday hours, including weekends and holidays, will be paid for by the City and back-charged to the Contractor. Such costs include overtime costs for the Engineer's Consultants.
- H. Testing Laboratory will separate and identify on the invoices and the costs covering all testing and inspections which are to be back-charged to the Contractor as specified above.
 - 1. Testing Laboratory will furnish to Engineer a cost estimate breakdown covering initial tests and inspections required by Contract Documents. Estimate will include number of tests, man-hours required for tests, field and plant inspections, travel time, and costs.
- I. Should it be considered necessary or advisable by the Engineer at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the completed work, the Contractor shall, on request, promptly furnish necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall be responsible for all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, additional cost of labor and material necessarily

SECTION 014000 – QUALITY REQUIREMENTS

involved in the examination and replacement shall be reimbursed to the Contractor.

1.08 QUALITY CONTROL

- A. Engineer Responsibilities: Where quality control services are indicated as Engineer's responsibility, Engineer will engage a qualified testing agency to perform these services.
1. Engineer will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to the Engineer or agency are Contractor's responsibility. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality control services.
 - a. Contractor shall not employ same entity engaged by City or Engineer, unless agreed to in writing by Engineer.
 2. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of 10 working days in advance of all required tests, and a minimum of two working days in advance of all required inspections. Extra laboratory expenses resulting from a failure to notify the Laboratory will be paid by the City and back- charged to the Contractor.
 3. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection. Charges due to insufficient advance notice cancellations or time extension will be paid for by the City and back-charged to the Contractor.
 4. Contractor shall notify the Testing Agency a minimum of three working days in advance of the manufacture or material to be supplied by him under the Contract Documents, which must by terms of the Contract be tested, in order that the Agency may arrange for the testing of such material at the source of supply.
 - a. Material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from the Engineer that such testing and inspection will not be required, shall not be incorporated in the Project.
 5. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.

SECTION 014000 – QUALITY REQUIREMENTS

6. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section 01 33 00, "Submittals."
- D. **Retesting/Re-inspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report of each test, inspection, and similar quality control service to Engineer, with copy to Contractor and to authority having jurisdiction.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
 7. **Reporting test failures:** Immediately upon Testing Laboratory determination of a test failure, the Laboratory will telephone the results of test to Engineer. On the same day, Laboratory will send written test results to those named on the above distribution list.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.

SECTION 014000 – QUALITY REQUIREMENTS

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.09 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: City or Engineer will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of City, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality control service to Engineer with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which include a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspection of the corrected work.

1.10 ENGINEER'S INSPECTION

- A. An Inspector employed by the City will be assigned to the work.
- B. The Contractor shall notify the Inspector a minimum of two working days in advance of execution of all work that requires inspection.
- C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. Inspector shall have free access to any

SECTION 014000 – QUALITY REQUIREMENTS

or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to be fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to comply with the Contract requirements.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Section 017329, CUTTING AND PATCHING.
- B. Protect construction exposed by or for quality control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

3.03 TESTS AND INSPECTIONS

- A. Perform tests and inspections for the following in conformance with the California Building Code, Title 24, Part 2, of CCR.

SECTION 014000 – QUALITY REQUIREMENTS

- B. Excavations and Foundations (Chapter 18 and Table 1705.6):
 - 1. Earth fill compaction – Section 1803.5.
 - 2. Excavation and fill for foundations – Section 1803.5.
 - 3. Placement, compaction, and inspection of backfill per Sections 1803.5 and 1804 for fills supporting foundation.

- C. Concrete (Chapter 19, Chapter 17).
 - 1. Materials:
 - a. Portland Cement Tests – Section 1903.
 - b. Concrete Aggregates – Section 1903.6.
 - c. Reinforcing Bars – Section 1913.2 and ASTM A370.
 - d. Waiver of Testing Rebar - Section 1913.2.
 - e. Batch Plant Inspection – Section 1705.3.2.
 - f. Waiver of Batch Plant Inspection and Tests – Section 1705.3.
 - 2. Concrete Quality:
 - a. Proportions of Concrete – Sections 1904 and 1905.
 - b. Strength Tests of Concrete – Section 1905.1.
 - 3. Concrete Inspection:
 - a. Job Site Inspection – Section 1705.3 and Table 1705.3.
 - b. Batch Plant or Weighmaster Inspection – Section 1705.3.2.
 - c. Reinforcing Bar Welding Inspection – Table 1705.3.
 - 4. Anchors in Concrete:
 - a. Drilled-In-Expansion Bolts or Epoxy-Type Anchors in Concrete – Table 1705.3.

- D. Masonry (Chapter 21).
 - 1. Materials:
 - a. Mortar and Grout Aggregates – Sections 2103.9 and 2103.13.
 - 2. Masonry Quality:
 - a. Mortar and Grout Tests – Section 2105.2.2.1.4.
 - b. Masonry Prism Tests – Sections 2105.2.2.2, and 2105.3.
 - c. Masonry Core Tests – Section 2105.5.
 - d. Reinforcing Bar Tests (Chapter 19) – Section 1913.2.
 - 3. Masonry Inspection:
 - a. Reinforcing Bar Welding Inspection – Table 1705.3.

- E. Structural Steel and Cold Formed Steel (Chapter 22).
 - 1. Materials:
 - a. Structural Steel and Cold Formed Steel – Sections 2202.1, 2205, 2210, 2211, and 2213.1.
 - b. Material Identification – Section 1705.2, Table 1705.2.1, and Section 1705.12.
 - 2. Inspection and Tests of Structural Steel:
 - a. Tests of Structural and Cold Formed Steel – Section 2213.1.
 - b. Tests of High Strength Bolts, Nuts and Washers – Section 2213.1 and Table 1705.2.1.
 - c. Tests of End Welded Stud – Section 2213.2.

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- d. Shop Fabrication Inspection – Table 1705.2.1.
 - e. Welding Inspection – Table 1705.2.1, AISC 360, and AISC 341.
 - f. Nelson Stud Welding – Section 2213.2, AISC 360, and AISC 341.
 - g. High Strength Bolt Inspection – Table 1705.2.1, and AISC 360.
 - h. Non-Destructive Weld Testing – Section 1705.2.1, AISC 341 Appendix Q and W, as applicable.
 - i. Test Unidentified Materials – ASTM A370-06.
 - j. Verification of Reinforcing Steel Weldability – Table 1705.2.1.
 - k. Inspect Welding of Reinforcing Steel – Table 1705.2.1.
 - l. Roof Deck and Floor Deck Welding – AISC 360, SIAC 341, and CBC Table 1705.2.1.
- F. Wood (Chapter 23).
- 1. Materials:
 - a. Lumber and Plywood Grading – 2303.
- G. Concrete Floors: Conduct calcium chloride moisture vapor testing of all interior concrete floor slabs which will receive a finish material or coating. Cost shall be paid for by the Contractor. Comply with the following:
- 1. Verify that new concrete floors comply with ASTM F710; determine adhesion and dryness characteristics by conducting bond and moisture tests recommended by the floor covering manufacturer and ASTM F1869.
 - 2. Verify that new concrete floors are dry and exhibit negative alkalinity, carbonization, and dusting. Concrete floor surfaces shall be tested for moisture emissions and alkalinity with the building acclimated to the working environment of the city.
 - a. Perform tests after HVAC system has been in continuous use for 36 hours to maintain a minimum ambient temperature of 72 deg F.
 - b. Perform tests in accordance with ASTM F1869 as follows:
 - 1) Three tests for areas up to 1,000 square feet; add one additional test for each 1,000 square feet thereafter.
 - c. Timing of Tests:
 - 1) New concrete: As late in process as practical to allow maximum drying of concrete, but not less than 2 weeks prior to scheduled installation of floor covering.
 - d. If moisture emission rates exceed the minimum levels indicated by the flooring specifications, notify the Engineer. The Contractor may be directed to install “Vapor Reduction System” as specified in Division 07, THERMAL AND MOISTURE PROTECTION, prior to installing floor covering, utilizing the vapor reduction allowance.
 - e. Calcium chloride and moisture vapor testing shall be performed as an installation prerequisite in all Division 09, FINISHES, floor finish Sections.
 - 3. Where the vapor reduction system is required to be applied, repeat moisture testing as specified above to determine if vapor transmission has been reduced to acceptable levels.

SECTION 014000 – QUALITY REQUIREMENTS

3.04 EARTHWORK

- A. The Geotechnical Engineer of Record or a Geotechnical Engineer selected by the Engineer will provide continuous inspection of fill and will field test fill and earth backfill as placed and compacted and inspect excavations and subgrade before concrete is placed and provide periodic inspection of open excavations, embankments, and other cuts or vertical surfaces of earth. The Geotechnical Engineer will submit a report indicating that he has observed and tested fills and that in his opinion the fills were placed in accordance with the project specifications. Deliver report to Engineer and Authority having jurisdiction.
- B. Contractor shall remove unsatisfactory material, reroll, adjust moisture, place new material, or in the case of excavations, provide proper protective measures, perform other operations necessary, as directed by the Geotechnical Engineer whose decisions and directions will be considered final.
- C. Geotechnical Engineer may require deepening of footings and so order such deepening in accordance with Division 31, EARTHWORK, Sections.
- D. Soils Test and Inspection Procedure:
 - 1. Allow sufficient time for testing and evaluation of results before material to be incorporated into the project is needed. The Geotechnical Engineer shall be sole and final judge of suitability of all materials to be imported to the project.
 - 2. Laboratory compaction tests to be used will be in accordance with ASTM D1557.
 - 3. Field density tests will be made in accordance with ASTM D1556.
 - 4. Number of tests will be determined by Geotechnical Engineer. Materials in question may not be used pending test results.
 - 5. Excavation and embankment inspection procedure. Geotechnical Engineer will visually or otherwise examine such areas for bearing values, cleanliness and suitability.
 - 6. Earthwork Test Reports: In order to avoid misinterpretations by the reviewing agencies, all retest results shall be reported on the same sheet, immediately following the previous failure test to which it is related. Retests shall be clearly noted as such.

3.05 TESTING OF CONCRETE

- A. Concrete Mix Design:
 - 1. The City will pay for the sampling of aggregate and preparation or review and approval of mix design one time for each strength and aggregate size specified. Testing cost for approval of additional mix designs will be paid by the City and back-charged to the Contractor. Continuous plant inspection and all tests of materials will be paid by the City, but the Contractor will be back-charged for all tests performed on material that do not meet

SECTION 014000 – QUALITY REQUIREMENTS

- specification requirements. Two copies of the mix designs shall be filed with the Engineer for record purposes only, not for review or approval.
2. Test concrete aggregates for mix design only.
 3. Deliver samples of approved aggregate to Project for comparison with material delivered, if job mixed concrete is used.
 4. Test suitability of aggregates in accordance with ASTM C88 if material is under suspicion and if so directed by Engineer or authority having jurisdiction.
- B. If compressive result of test specimens fail to show compressive strength specified, remove and replace concrete or adequately strengthen in a manner acceptable to Engineer and authority having jurisdiction.
- C. Certification shall be made that tests, whose results shall be shown, were made in accordance with provisions of Rules and Regulations of authority having jurisdiction.
- D. Make all tests, take samples, and prepare samples in accordance with the latest standards adopted by American Society for Testing and Materials, referred to as ASTM.
- E. Structural concrete mixed at certified approved concrete batch plants shall have quality control as follows:
1. Laboratory designed mixes using adequate cement factors.
 2. Continuous batch plant inspection by qualified test technician.
 3. Inspection shall comply with CBC requirements.
- F. Structural concrete mixed at non-approved batch plants shall have quality control as follows:
1. Laboratory designed mixes using adequate cement factors.
 2. Continuous batch plant inspection by qualified test technician.
 3. Measure all water, including wash water, so total on truck does not exceed 95 percent maximum allowed in mix design.
 4. Legible, certified weighmaster's certificates shall be provided the inspector for all structural and non-structural concrete.
 5. At end of job, Contractor shall furnish affidavit to authority having jurisdiction, Engineer, certifying that all concrete furnished conforms to requirements of CCR Title 24 Part 2.
- G. Waiver of Batch Plan Inspection: Batch plant inspection may be waived if the concrete plant complies fully with the requirements of UBC Standard 19-3 and has been certified to comply with the requirements of the National Ready Mixed concrete Association. The plant must be equipped with an automatic batcher in which the total batching cycle, except for the measuring and introduction of an admixture, is completed by activating a single starter device.

SECTION 014000 – QUALITY REQUIREMENTS

- H. City's Inspector or Special Inspector will do the following:
1. Inspect placing of reinforcing steel and concrete at Project.
 2. Obtain load ticket and identify mix before accepting each load. Keep daily record of concrete placement, identifying each truckload, time of receipt, and location of concrete in structure. Keep record until completion of Project and make available for inspection by authority having jurisdiction.
 3. During progress of work, take code required number of test cylinders, but at least one set of cylinders for each 50 cubic yards or fractional part thereof for each class of concrete and at least one set from each day's pour. Test cylinders need not be made for concrete used in non-structural elements of the work.
 4. One set of cylinders shall consist of four samples all taken from same batch, one to be tested at age of 7 days and two at 28 days.
 5. Make and store cylinders according to ASTM C31.
 6. Deliver cylinders to laboratory or store cylinders in a suitable protected environment for pick up by laboratory personnel.
 7. Make slump test of wet concrete according to test for slump of Portland cement concrete, ASTM C143, at least at the same frequency that the cylinders are taken.

3.06 REINFORCING STEEL

- A. Tests:
1. Tests shall be performed before the delivery of steel to Project site. Steel not meeting specifications shall be rejected and shall not be shipped to the Project.
 2. Testing procedure shall conform to ASTM A 615.
 3. Sample at the place of distribution, before shipment: Make one tensile test and one bending test from samples out of 10 tons, or fraction thereof, of each size and kind of reinforcing steel, where taken from bundles as delivered from the mill and properly identified as to heat number. Mill analysis shall accompany report. Where identification number cannot be ascertained, or where random samples are taken, make one series of tests from each 2-1/2 tons, or fraction thereof, of each size and kind of reinforcing steel. Tests on unidentified reinforcing steel will be paid by the City and back-charged to the Contractor. Samples shall include not fewer than two pieces, each 18 inches long, of each size and kind of reinforcing steel. Inspection of welding of reinforcing steel shall be done by a specially qualified laboratory inspector and tested in accordance with AWS D1.4.
 4. All steel shall have testing laboratory tags of approval attached to the steel bundle when shipped to the job site.
- B. Inspector will inspect all reinforcement for concrete work for size, dimensions, locations and proper placement. Inspector shall be present during welding of all reinforcing steel.

SECTION 014000 – QUALITY REQUIREMENTS

3.07 MASONRY

A. Inspector/Special Inspector:

1. Masonry work shall be continuously inspected during laying and grouting by an Inspector specially approved for that purpose by the Authority having jurisdiction. The Inspector shall make test samples and perform such tests as are required.
2. The Inspector shall check the materials, details of construction and construction procedure. The Inspector shall furnish a verified report that of his own personal knowledge the work covered by the report has been performed and materials used and installed are in accordance with and in conformance to, the duly approved drawings and specifications.
3. No masonry shall be installed without the presence of the Special Inspector.

B. Masonry Tests:

1. Concrete Masonry Units: Test each type of unit for strength in accordance with CBC 1705.4; for absorption in accordance with ASTM C140; for drying shrinkage in accordance with ASTM C426.
2. Mortar and Grout Tests: At the beginning of all masonry work, at least one test sample of the mortar and grout shall be taken on three successive working days and at least at 1-week intervals thereafter. The samples shall be continuously stored in moist air until tested. They shall meet the minimum strength requirement given in CCR Title 24 Part 2, Section 2105.2.2.1.4. Additional samples shall be taken whenever any change in materials or Project conditions occur or whenever in the judgment of the Engineer or the authority having jurisdiction, such tests are necessary to determine the quality of the material. Test specimens for mortar and grout shall be made as set forth in UBC Standard Nos. 21-16 and 21-18. In making the mortar test specimens the mortar shall be taken from the unit soon after spreading. After molding, the molds shall be carefully protected by a covering which shall be kept damp for at least 24 hours, after which the specimens shall be stored and tested as required for concrete cylinders. In making grout test specimens, an absorbent paper liner shall be used and the mold left in place until the specimen has hardened. The prisms shall be stored as required for concrete cylinders. They shall be tested in the vertical position.
3. Masonry Core Tests: Not less than two cores having a diameter of 6 inches shall be taken from the Project. At least two cores shall be taken for each 5,000 square feet of the greater of the masonry wall area or of floor area or fraction thereof. The Engineer in responsible charge of the project or the Inspector shall select the areas for sampling. Core samples shall not be soaked before testing. Materials and workmanship shall be such that, for all masonry when tested in compressions, cores shall show a strength of at least 1,500 psi. When tested in shear the unit shear on the cross section of the core shall not be less than 100 lbs per square inch. Shear testing apparatus shall be of a design approved by the authority having jurisdiction. Visual examination of all cores shall be made to ascertain if the joints are

SECTION 014000 – QUALITY REQUIREMENTS

filled. The City's Inspectors or testing agency shall inspect the coring of the masonry walls and shall prepare a report of coring operations for general distribution. Such report shall include the total number of cores cut, the location, and the condition of all cores cut on the Project regardless of whether or not the core specimens failed during cutting operation. All cores shall be submitted to the laboratory for examination.

4. The Contractor, at his expense, shall patch all core holes with the specified grout. Use matching masonry face shells, when exposed to view.

3.08 STRUCTURAL STEEL

- A. Mill certificates or affidavits and manufacturers' certification shall be supplied to the Testing Laboratory and Inspector for verification of steel materials. Each piece shall have the heat number clearly marked. Testing Laboratory shall be notified at least 3 weeks in advance of fabrication and supplied with the reports so that it can make a shop inspection of the steel.
- B. Tests of Steel Materials: If structural steel cannot be identified by heat or melt numbers, or if its source is questionable, not less than one tension test and one bend test will be made for each 5 tons or fractional part thereof. Such testing shall be paid for by the City and back-charged to the Contractor. Structural steel identified by heat or melt numbers marked at the mill need not be tested, except testing is required of steel with F_y greater than 36 ksi.
- C. General Inspection:
 1. Testing laboratory will visit the fabricator's plant to verify that materials used check with the mill tests, affidavits of test reports, and that fabrication and welding procedures meet specifications.
 2. Testing laboratory will visually check fabricated steel against the contract drawings and reviewed shop drawings for compliance and will make physical tests and measurements as required to meet the specifications. Single pass fillet welds may be visually checked.
 3. Inspection of shop fabrication: Inspection of shop fabrication may be required for structural work if so designated on the Structural Tests and Inspections list or as indicated in Contract Documents. This inspection shall be made by a qualified inspector approved by the Authority having jurisdiction. He shall furnish the Engineer and the authority having jurisdiction a report duly verified by him that the materials and workmanship conform to the approved plans and specifications.
 4. Approved fabricators: In addition to welding inspection, fabrication inspection will be required for all work done on the premises of a steel fabricator who does not hold a currently valid certificate CCR Title 24 Part 2, Section 1701.5, Approved Fabricators. The cost of the fabrication inspection will be paid by the City and back-charged to the Contractor.

SECTION 014000 – QUALITY REQUIREMENTS

5. Inspection of welding (regardless of whether fabricator has “Approved Fabricator Status”) shall be in accordance with the requirements of CCR title 24 Part 2, Table 1705.2.1. Weld inspection shall be continuous.
 6. Erection inspection: If so designated on the Structural Tests and Inspections list, Testing Laboratory will visually inspect field welded connections, perform such additional test and inspections of field work as are required by the Engineer and prepare test reports for the Engineer’s review.
 7. Shop fabrication inspection outside of area: The added cost of shop fabrication inspection, and material testing outside the State of California or 150-mile radius of the Project site will be paid by the City and back-charged to the Contractor.
 8. Ultrasonic testing: All full penetration multi-pass groove welds shall be subject to ultrasonic testing.
 - a. Defective welds shall be repaired and retested with ultrasonic equipment.
 - b. Initially, all multi-pass groove field welds shall be tested at the rate of 100 percent of each individual welder. If rejectable defects occur in less than 5 percent of the welds tested, the frequency of testing may be reduced to 25 percent. If the rate of rejectable defects increases to 5 percent or more, 100 percent testing shall be reestablished until the rate is reduced to less than 5 percent. The percentage of rejects shall be calculated for each welder independently.
 - c. When ultrasonic indications arising from the weld root can be interpreted as either a weld defect or the backing strip itself, the backing strip shall be removed at the expense of the Contractor, and if no root defect is visible, the weld shall be retested. If no defect is indicated on this retest, and no significant amount of the base and weld metal have been removed, no further repair or welding is necessary. If a defect is indicated, it shall be repaired at the Contractor’s expense.
 - d. No steel shall be shipped without Testing Laboratory’s mark or tags of acceptance on each and every piece of steel.
 9. The ultrasonic instrumentation shall be calibrated by the technician to evaluate the quality of the welds in accordance with AWS D1.1.
 10. Should defects appear in welds tested, repairs shall be similarly inspected at the Contractor’s expense and at the direction of the Engineer until satisfactory performance is assured.
 11. Other methods of inspection, for example, X-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if felt necessary by the Engineer/Inspector/Inspection Laboratory.
- D. Inspection and Tests for End Welded Studs:
1. Inspection of all the shop and field welding operations for the automatic end welded studs shall be made in accordance with CCR title 24 Part 2, Section 2204.1 and AISC 360 by a qualified welding inspector approved by the Authority having jurisdiction. The type and capacity of the welding equipment shall be in accordance with the manufacturer’s

SECTION 014000 – QUALITY REQUIREMENTS

recommendations and shall be checked and approved by the welding inspector.

2. At the beginning of each day's work, a minimum of two test stud welds shall be made with the equipment to be used on metal which is the same as the actual work piece. The test studs shall be subjected to a 90-degree bend test by striking them with a heavy hammer. After the above test, the weld section shall not exhibit any tearing out or cracking.

E. Corrections:

1. Correct deficiencies in structural steel work, which inspections and test report indicate to be not in compliance with the specified requirements.
2. Perform additional test required to reconfirm noncompliance of the original work and to show compliance of corrected work. Costs for all additional tests will be paid for by the City and back-charged to the Contractor.

3.09 METAL DECKING

- A. Mill certificates or affidavits and manufacturers' certification shall be supplied to the Inspector for verification of steel materials. City's Inspector shall be notified at least two working days in advance of fabrication and supplied with the reports so that he can make a shop inspection of the metal deck.

B. Tests of Steel Materials:

1. Metal decking identified by heat or melt numbers and accompanied by mill analysis and test reports do not require additional testing.
2. If metal decking cannot be identified or its source is questionable, not less than one tension and elongation test and one bend test will be made for each 5 tons, or fractional part thereof, or each gage. Such testing shall be paid for by the City and back- charged to the Contractor.

C. General Inspection:

1. Project Inspector will visually check metal decking delivered to the Project against the working and reviewed shop drawings for compliance and he will make physical tests and measurements, as required to meet the specifications.
2. Inspection of welding shall be in accordance with the requirements of CCR Title 24 Part 2, Section 2204.

D. Metal Deck Welding:

1. Continuous inspection of all deck welding will be made. The Contractor shall supply samples and test pieces and provide facilities for inspection without extra charges.
2. Inspection of welding shall be made to ensure that seam welds and puddle welds are made in accordance with the Contract Documents. Inspection shall insure that proper electrodes, current, travel and speed are used and

SECTION 014000 – QUALITY REQUIREMENTS

that no cracks, serious undercutting, overlap, surface holes or slag inclusions occur.

3.10 ASPHALTIC CONCRETE PAVING

- A. Asphaltic concrete mix design proposed by the Contractor shall be submitted to the Engineer for review. Proposed mix may be tested for conformance with the specifications, including grading, asphalt content and stability.
- B. At the Engineer's option, one sample of the mix shall be taken during each day's paving operation and tested for asphalt content and gradation.
- C. At the engineer's option, continuous inspection of the paving operation shall be provided. Testing Laboratory shall check for proper thickness, proper mix temperatures, proper rolling procedures and general workmanship.

3.11 WATERPROOFING

- A. The City's Inspector will check wall surfaces and approve before application of membrane materials and verify that substrate surfaces are in satisfactory condition to receive membrane materials and furnish continuous inspection during application of membrane.
- B. Check minimum specified thickness of membrane waterproofing. For fluid-applied membrane check thickness every 100 square feet during application with a mil- thickness gage especially manufactured for the purpose.

3.12 ROOFING

- A. The Testing Laboratory may inspect deck surfaces before application of roofing materials and verify that substrate is in satisfactory condition to receive roofing. The Testing Laboratory will vapor barrier, insulation, coverboard, sheet metal flashing, counterflashings and reglets for satisfactory and waterproof installation.
- B. Perform additional test that may be required by individual Specification Sections.
- C. Perform structural tests and inspections in accordance with CBC Chapter 17.

END OF SECTION

SECTION 014213

ABBREVIATIONS

PART 1 - GENERAL

1.01 ABBREVIATIONS

- A. The following abbreviations may be used in the contract documents:
- | | |
|----------|--|
| AAMA | Architectural Aluminum Manufacturers' Association |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI | American Concrete Institute |
| AIA | American Institute of Architects |
| AIMA | Acoustical and Insulation Materials Association |
| AISC | American Institute of Steel Construction |
| ANSI | American National Standards Institute |
| APA | American Plywood Association |
| ASHRAE | American Society of Heating, Refrigerating, and Air-Conditioning Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials International |
| AWI | Architectural Woodwork Institute |
| AWPI | American Wood Preservers' Association |
| AWS | American Welding Society |
| BHMA | Builders Hardware Manufacturers' Association |
| BTU | British Thermal Unit |
| CAC | California Administrative Code |
| CBC | California Building Code |
| CDPH | California Department of Public Health |
| CEC | California Electric Code |
| CAL/OSHA | State of California Construction Safety Orders |
| CLFMI | Chain Link Fence Manufacturers' Institute |
| CMC | California Mechanical Code |
| COC | Chain of Custody |
| CPC | California Plumbing Code |
| CRSI | Concrete Reinforcing Steel Institute |
| CALTRANS | State of California, Business and Transportation Agency, Department of Transportation, "Standard Specifications" |
| EPD | Environmental Product Declaration |
| EPR | Extended Producer Responsibility |
| ESO | Electrical Safety Orders |
| FAA | Federal Aviation Administration |

SECTION 014213 – ABBREVIATIONS

FGMA	Flat Glass Marketing Association
FM	Factory Mutual System, Factory Mutual Engineering Corporation
FS	Federal Specifications
HPD	Health Product Declaration
IAQ	Indoor Air Quality
IBC	International Building Code
MDF	Medium density fibreboard
MM	State of California, Business and Transportation Agency, Department of Transportation, "Materials Manual"
NEC	National Electrical Code
NEMA	National Electric Manufacturers' Association
NFPA	National Fire Protection Association
PS	United States Department of Commerce Product Standard
RIS	Redwood Inspection Service
SCAQMD	South Coast Air Quality Management District
SFM	State of California, Office of State Fire Marshal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
TCA	Tile Council of America
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
USGBC	U.S. Green Building Council
USS	United States Standard
WCLIB	West Coast Lumber Inspection Bureau
WI	Woodwork Institute

- B. Additional abbreviations used only on the drawings are listed and defined thereon.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 014216

DEFINITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. General:
 - 1. Basic definitions are included here to define terminology used throughout specifications.
 - 2. Definitions given are in addition to terms defined in the General Provisions.

1.02 COMPLETION

- A. Completion: The meaning of terms such as “substantial completion,” “beneficial occupancy,” “field completion,” or any such terminology through which the opinion is expressed that contract Work is complete, shall be defined in City of Long Beach, Division H – General Requirements, Sections 6-8, Completion, Acceptance, and Warranty. No item warranty period covered under this contract shall commence until such completion.

1.03 THE CONTRACT

- A. The Contract is defined in the General Provisions.
- B. The Contract Documents shall not be construed to create a contractual relationship of any kind: 1) between the Consultant and Contractor, 2) between the Agency and a Subcontractor or Sub-subcontractor, or 3) between any persons or entities other than the Agency and Contractor.

1.04 FURNISH

- A. Unless specifically limited in context, means furnishing to project site items specified, to include packaging, shipping, unloading, storing, protecting, unpacking, relocating, and assembling if necessary.

SECTION 014216 – DEFINITIONS

1.05 INSTALL

- A. Means incorporating in the Work including all necessary labor, materials, equipment, and connections to perform work indicated and protection thereof after installation until Acceptance.

1.06 PROVIDE

- A. Means furnish and install.

1.07 THE CONTRACTOR SHALL

- A. In the interest of conciseness and an imperative writing style, any sentences, statements, and clauses used in the Specifications may exclude any form of the verb “shall” which is normally expressed in verb phrase with verbs such as “furnish,” “install,” “provide,” “perform,” “construct,” “erect,” “comply,” “apply,” and “submit”. Any such sentences, statements, and clauses are to be interpreted to include an applicable form of the phrase “the Contractor shall” and requirements described therein interpreted as mandatory elements of the Contract.

1.08 OBSERVATION

- A. “Observe” or “observation” means “to become generally familiar with the process and quality of the work and to determine if the work is proceeding in general accordance with the Contract Documents based on what is plainly visible at the construction site, without the removal of materials or other construction that is in place.”

1.09 ACCEPTABLE PERFORMANCE

- A. A component or system being able to meet specified design parameters under actual load.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.
- C. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Sanitary facilities, including drinking water and washing facilities.
 - 4. Storm and sanitary sewer.
- D. Support facilities include, but are not limited to, the following:
 - 1. Field office(s).
 - 2. Temporary enclosures.
 - 3. Waste disposal services.
 - 4. Construction aids and miscellaneous services and facilities.
- E. Security and protection facilities include, but are not limited to, the following:
 - 1. Temporary fire protection.
 - 2. Enclosure fence for the site with graphic screens.

1.02 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department, and rescue squad rules.
 - 5. Environmental protection regulations.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

- B. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
- C. Installer: Work to be performed only by workers thoroughly skilled and specifically trained in the techniques of installing prefinished interior panels. Installer to be currently approved by Manufacturer of prefinished panels.

1.03 STANDARDS – COMPLY WITH THE FOLLOWING LISTED STANDARDS

- A. NFPA 241, “Standard for Safeguarding Construction, Alterations, and Demolition Operations.
- B. ANSI A10 Series standards for Safety Requirements for Construction and Demolition.
- C. NECA Electrical Design Library Temporary Electrical Facilities.
- D. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70, National Electric Code.
- E. NFPA 10, Standard for Portable Fire Extinguishers.
- F. NFPA 241, Standard for Safeguarding Construction, Alterations, and Demolition Operations.

1.04 PROJECT CONDITIONS

- A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

1.05 APPROVALS

- A. Prior to the start of any on-site/off-site construction, the Contractor shall submit a construction plan to the Engineer for pedestrian protection, construction area perimeter fencing with custom-printed screen(s), street lane closures, construction staging, shoring excavations and the routing of construction vehicles (excavation hauling, concrete and other deliveries, etc.).

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Open-Mesh Fencing: Provide 0.120-inch (3 mm) thick, galvanized 2-inch (50-mm) chain link fabric fencing 6 feet (2 m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts.
- C. Contractor shall install FenceScreen.com Custom Printed Flex Mesh screen(s), Series 311, or equivalent, over chain link fencing. Fence screening shall be maintained along the perimeter of the development site during construction of the on-site improvements until final inspection by the City. The graphics shall depict positive images of the City or other artistic concepts. Fire Department related images are preferred. Prior to submitting the graphic design for printing, the Developer shall consult with Engineer to review and approve. Refer to the City of Long Beach “Graphic Guidelines for Temporary Fencing” published by the Department of Public Works, dated December 2021.
 - 1. A minimum of 40 percent of fenced area must contain city images. High resolution images are available upon request.
 - 2. Up to 35 percent of fenced area can contain project specific images.
 - 3. Up to 25 percent of fenced area can contain advertising for the site.
 - 4. The total square footage of fenced area shall be calculated by multiplying the height of the fence by the length of perimeter fencing.
 - 5. The following items shall be submitted for review and approval:
 - a. Plan drawing highlighting the perimeter fencing to be installed.
 - b. Color elevation depicting the images to be installed.
 - c. Breakdown of the total image areas per the categories outlined above within the “Requirements” section.
 - d. If deviating from the requirements outlined, a narrative must be submitted clearly explaining the reason(s) for deviation.
- D. All fencing and color graphic screening must be maintained in good condition. Damaged fencing must be replaced within 72 hours and faded, or torn graphics must be replaced in 1 week.

2.02 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel office activities and to accommodate project meeting specified in other Division 01, GENERAL REQUIREMENTS, Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
 - 3. Audio visual equipment necessary to facilitate virtual meetings.
 - 4. Drinking water and private toilet.
 - 5. Coffee machine and supplies.
 - 6. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 deg F to 72 deg F.
 - 7. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Agency Inspector Office: Provide private field office for Agency's use. Office may be a separate room within the Common-Use Field Office and shall be equipped with a plan table, mini-fridge, desk, and chair.
- D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.03 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch (19 mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110-Volt to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

- E. Internet and wireless services: Provide on-site Internet and Wireless services for use by the City Engineer, City Inspector and Contracting team.
- F. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- G. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- H. Heating Equipment: Unless Engineer authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials, and equipment. Comply with company recommendations.
 - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

3. Obtain temporary easements as necessary to bring temporary utilities to the site where the existing easements cannot be used for that purpose.
 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Agency or Architect. Neither the Agency nor Architect will accept cost or use charges as a basis of claims for Change Orders.
- B. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear.
1. Install electric power service underground, except where overhead service must be used.
 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

3.03 SUPPORT FACILITIES INSTALLATION

- A. Dewatering: Provide dewatering facilities and equipment to maintain the site, excavations, and construction free of water.
- B. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- C. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.
- B. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

- C. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
- D. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth or portable fencing, if appropriate, with sufficient hold down weight to prevent overturning. Refer to Section 2.01.C for fencing screening.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- F. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Unless the Agency requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period.

END OF SECTION

SECTION 015731

INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This section includes construction indoor air quality management procedures and requirements pertaining to the CALGreen compliance.
- B. Refer to Section 018113, SUSTAINABLE DESIGN REQUIREMENTS, for additional information and requirements.
- C. The Contractor shall develop procedures and maintain the Project site to eliminate and mitigate potential sources of indoor air pollutants to enhance the indoor air quality of the Project site and the finished occupied building.

1.03 RELATED SECTIONS

- A. Section 013542, CALGREEN REQUIREMENTS.

1.04 CALGREEN REQUIREMENTS

- A. Construction IAQ Management Plan, During Construction.
 - 1. The Contractor shall develop and implement an IAQ Management Plan for the project that meets or exceeds the Control Measures of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Current Edition, Chapter 3.
 - 2. Examples of Construction IAQ Management measures which may be implemented for Project include:
 - a. All absorptive building materials shall be kept dry to avoid the introduction of moisture into the building interior.
 - b. Any porous materials that have been exposed to moisture should be dried before being installed. Any porous material that has remained

SECTION 015731 – INDOOR AIR QUALITY (IAQ) MANAGEMENT

- wet longer than 48 hours or shows any sign of mold shall be discarded and replaced.
- c. All products used shall comply with VOC requirements of the SCAQMD, LEED, and CALGREEN
 - d. Once framing and drywall begin as well as the installation of the mechanical equipment, access to the building interior shall be limited to reduce the likeliness of contaminants entering the building.
 - e. No smoking will be allowed within the building envelope at any time during or after construction.
 - f. Plastic, fabric, laminates, or assembled materials that are packaged or rolled-up shall be opened up and ventilated for a minimum of 24 hours outside of building.
 - g. HVAC ductwork and equipment will be stored in a clean, dry location.
 - h. Until HVAC system is fully installed, all parts of the system shall be covered and sealed or stored in a location where moisture and contaminants are not introduced.
 - i. Use of the HVAC system during construction is prohibited until drywall construction is complete.
 - j. All air inlets and outlets shall be sealed during construction until the system is ready for start-up.
 - k. Methods of minimizing dust from cut-off saws, drywall sanders, etc. shall be used.
 - l. Dust collection systems shall be used on applicable tools. Duct collection bags shall be emptied into receptacles located outside of the building.
 - m. Use damp rags, mops or vacuum cleaners to clean up dust.
 - n. Sweeping compounds shall be used to keep floors clean of dirt and dust.
 - o. Work areas will be kept dry. If leaks occur, work areas will be promptly mopped dry.
 - p. Products containing VOCs will be stored in sealed containers and covered whenever not in use.
 - q. Containers of fuel, paints, finishes, and solvents shall be kept sealed when not in use and shall be stored outside of the building.
 - r. Porous materials should be installed after building envelope is closed.
 - s. Carpeting and furnishings shall not be installed until after interior finishes have fully cured.
3. If permanently installed air handlers are used during construction, Contractor to install MERV 8 (as determined by ASHRAE 52.2-Current Edition) air filters at all return air grilles in addition to other specified HVAC system filtration media.
 4. If permanently installed air handlers are used during construction, Contractor to replace all HVAC system filtration media immediately prior to occupancy.
- B. Construction IAQ Management Plan, Before Occupancy.
1. The Contractor shall complete a flush-out of the building prior to occupancy:

SECTION 015731 – INDOOR AIR QUALITY (IAQ) MANAGEMENT

- a. The project must flush-out the unoccupied building with un-recirculated outdoor air totaling 14,000 cf/sq.ft. of floor area.
 - b. During the flushout period the HVAC systems must maintain an internal temperature of at least 60 deg F and relative humidity no higher than 60 percent.
 - c. The flush-out period will not commence until all wet trades and finishes have been completed for the building.
 - d. If any construction activity occurs within the building during the flush-out period it must be activities that do not generate dust, debris, emissions, or other potential indoor air pollutants.
 - e. The flush-out period shall be accounted for and shown in the Contractor's Construction Schedule.
2. If flushout prior to occupancy is not feasible, the unoccupied space must be initially flushed-out with un-recirculated outdoor air totaling at least of 3,500 cf/sq.ft. of floor area to the space.
 - a. Following the initial flush-out period, the project may ventilate the building at a minimum rate of 0.30 cfm/sq.ft. of outside air until a total of 14,000 cf/sq.ft. of outside air has been delivered to the space.
 - b. During each day of the flush-out period, ventilation shall begin 3 hours prior to occupancy and continue during occupancy.

1.05 CALGREEN DOCUMENTATION SUBMITTALS

- A. Construction IAQ Management Plan, During Construction.
 1. The Contractor shall provide a copy of the IAQ Management Plan.
 2. Contractor to provide photos (six photos at three different times, 18 total) to illustrate the implemented IAQ management procedures.
 3. Contractor to confirm if the permanently installed air handlers were used during construction. Submit information on HVAC filtration media (manufacturer, model, MERV rating, location of installed filters).
- B. Construction IAQ Management Plan, Before Occupancy.
 1. The Contractor shall confirm the IAQ approach taken (pre-occupancy flush-out or flush-out with early occupancy).
 2. The Contractor shall provide a narrative describing the project's specific flush-out procedures including dates, times, and air volumes of flush-out.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product Basis of Design submittals; and comparable products.
- B. Refer to Section 012500, SUBSTITUTIONS for procedures regarding substitution requests.

1.03 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term “product” includes the terms “material,” “equipment,” “system,” and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except those products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words “basis-of-

SECTION 016000 – PRODUCT REQUIREMENTS

design product,” including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

- C. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Refer to Section 012500, SUBSTITUTIONS, submittal and processing requirements.

1.04 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
- B. Include data to indicate compliance with the requirements specified in “Comparable Products” Article.
- C. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within 1 week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - 1. Form of Approval: As specified in Section 013300, SUBMITTAL PROCEDURES.
 - 2. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300, SUBMITTALS PROCEDURES. Show compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

SECTION 016000 – PRODUCT REQUIREMENTS

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.
 - 8. Provide a secure location and enclosure at Project site for storage of materials and equipment for Agency's construction forces. Coordinate location with Engineer.

1.07 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Agency.

SECTION 016000 – PRODUCT REQUIREMENTS

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Agency.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700, CLOSEOUT PROCEDURES.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Engineer reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Engineer will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

SECTION 016000 – PRODUCT REQUIREMENTS

- B. Product Selection Procedures:
 - 1. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 - 2. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements. The product with “basis of design” designation in the list is the product upon which the design is based. If the Contractor selects a subsequent product in the list, Contractor must bear the cost of re-design and construction.
 - 3. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

- C. Visual Matching Specification: Where Specifications require “match Engineer's sample,” provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500, SUBSTITUTIONS, for proposal of product.

- D. Visual Selection Specification: Where Specifications include the phrase “as selected by Engineer from manufacturer's full range” or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 PRODUCT SUBSTITUTIONS

- A. Timing: Engineer will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Engineer.

- B. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - 1. Requested substitution offers Agency a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Agency must assume. Agency's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Agency, and similar considerations.
 - 2. Requested substitution does not require extensive revisions to the Contract Documents.

SECTION 016000 – PRODUCT REQUIREMENTS

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor' Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. List of similar installations for completed projects with project names and addresses and names and addresses of Architect's and Owner's if needed.
11. Samples, if requested.

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 016500
DELIVERY AND STORAGE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work includes:
 - 1. Furnish all labor, materials, tools, equipment and services for delivery, handling, and storage of materials and equipment as indicated in accordance with provisions of Contract Documents.
 - 2. Completely coordinate with all other Contract work.
- B. Comply with applicable codes.
- C. Provide fire protection.
- D. Contractor will arrange for delivery, unload, handle, and properly store all Owner-furnished, Contractor-installed items (OFCI).

1.02 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 PRODUCT DELIVERY

- A. By manufacturer's normal means unless otherwise required by Contract Documents.
- B. In original labeled containers.
- C. Where applicable, with UL labeling on packages.
- D. Contractor responsible for acceptance at site.

SECTION 016500 – DELIVERY AND STORAGE

- E. Inspect items for damage upon delivery.

3.02 PRODUCT HANDLING AND STORAGE

- A. Use methods to avoid damage to item or structure.
- B. Protect weather fragile items from weather damage.
- C. Handle and store bulk aggregates to avoid contamination.
- D. Store to allow air circulation.
- E. Store only in authorized areas on site.
- F. Replace damaged items. Repair only with Engineer's prior written acceptance.
- G. Protect installed items as required until acceptance of Work.
- H. Uncrate, assemble, if required, and remove debris.
- I. When off-site storage is authorized, perform re-handling to move items to site at no added cost.

3.03 CLEANUP

- A. Remove excess materials from site.

END OF SECTION

SECTION 017135

RESTORATION OF IMPROVEMENTS

PART 1 - GENERAL

1.01 STRUCTURES

- A. The Contractor shall carefully cut and or remove such existing structures, utilities, and improvements as required to complete the work, including but not limited to curbs, gutters, pipelines, sidewalks and utility poles, as may be necessary for the performance of the work and shall rebuild the structures thus removed in as good a condition as found. The Contractor shall also repair existing structures or improvements, which may be damaged as a result of the work under this contract.

1.02 ROADS AND STREETS

- A. Unless otherwise specified, roads and streets in which the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this contract, shall be resurfaced and brought to the original grade and section by the Contractor. Roadways used by the Contractor shall be cleaned and repaired to local County and State Standards. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean solid, saw-cut vertical faces, and shall be free of loose material.

1.03 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS

- A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored to their original condition or better.
- B. Existing guard posts, barricades, and fences shall be protected and replaced if damaged.
- C. Special attention shall be given to avoid trees, bushes and shrubs not indicated for removal or noted to be protected in place

1.04 PROTECTION OF EXISTING INSTALLATIONS

- A. The Contractor shall immediately correct or replace existing equipment, controls or systems that are damaged as a result of his operations.

SECTION 017135 – RESTORATION OF IMPROVEMENTS

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 1. Construction layout.
 2. Field engineering and surveying.
 3. General installation of products.
 4. Coordination of Agency-installed products.
 5. Progress cleaning.
 6. Starting and adjusting.
 7. Protection of installed construction.
 8. Correction of the Work.

1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Land Surveyor.
- B. Final Property Survey: Submit one PDF copy for initial review. Respond to comments and submit 10 copies showing the Work performed and record survey data.

1.04 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

SECTION 017300 – EXECUTION

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.

- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water-service piping, and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

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3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated.
 - 3. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and

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elevations for use with control lines and levels. Level foundations and piers from two or more locations.

- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.04 FIELD ENGINEERING

- A. Identification: Engineer will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official “property survey.”

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3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 OWNER FURNISHED PRODUCTS

- A. Owner Furnished Owner Installed (OFOI):
 - 1. Site Access – Provide access and support for OFOI installation
 - 2. Coordination – Provide cooperation and coordination for the installation of these items and systems
- B. Owner Furnished Contractor Installed (OFCI):
 - 1. Site Access – Provide access and support for OFCI installation including storage of items on site prior to installation.
 - 2. Coordination – Provide cooperation and coordination for the installation of these items and systems.

3.07 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris. Dispose of waste to a legal disposal facility.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are

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not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted. Comply with waste disposal requirements in Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.08 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 014000, QUALITY REQUIREMENTS.

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3.09 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 017329, CUTTING AND PATCHING.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017329
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes procedural requirements for cutting and patching of pavement for utility tie-ins through existing street improvements.

1.03 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, submit to Engineer for review materials that, when installed, will match the visual and functional performance of in-place materials.

SECTION 017329 – CUTTING AND PATCHING

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- B. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.03 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. Concrete and Asphalt Pavement: Cut using a cutting machine, such as an abrasive saw where cutting passes through concrete sidewalk paving, remove concrete from joint to joint.
 - 2. Excavating and Backfilling: Comply with requirements in applicable Division 02 Specification Sections where required by cutting and patching operations.
 - 3. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing-up, and similar operations following performance of other Work. Patch with durable

SECTION 017329 – CUTTING AND PATCHING

seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where patches at asphalt occur, overlay asphalt a minimum of one foot past the trench opening. Slurry-coat the trench area to match existing adjacent pavement.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 017401

CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work includes:
 - 1. Furnish all labor, materials, tools, equipment, and services for all cleaning as indicated in accordance with provisions of Contract Documents.
 - 2. Completely coordinate with all other Contract work.

1.02 FIRE PROTECTION

- A. Store volatile waste in covered metal containers.
- B. Remove from premises daily.

1.03 POLLUTION CONTROL

- A. Conduct cleanup and disposal operations to comply with local ordinances and anti-pollution laws.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS

- A. Use materials recommended by manufacturers of surfaces to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

- A. Clean all items installed under this Contract.
 - 1. Leave free of stains, damage, or defects prior to final acceptance.
 - 2. Include washing, sweeping, polishing of all finished wall surfaces, floors, windows, hardware, mirrors, lighting fixtures and items of equipment.

SECTION 017401 – CLEANING

3. Replace damaged or defaced items not acceptable to Engineer, to his satisfaction at no additional expense to Agency

3.02 DURING CONSTRUCTION

- A. Clean up all waste materials, rubbish, and debris from site and access and dispose of off-site.
- B. Repair, patch, and touch-up marred surfaces to match adjacent finishes damaged by his own operations.
- C. Schedule cleaning operations so that contaminants resulting from cleaning do not fall on wet painted surfaces.
- D. Leave the Work "broom clean."

3.03 FINAL CLEANING

- A. Use experienced workmen or professional cleaners for final cleaning.
- B. At completion of construction, just prior to acceptance or occupancy, perform final cleaning.
- C. Remove dirt, stains, labels, protective films, and foreign materials.
- D. Repair and touch-up marred areas.
- E. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces of fixtures, hardware, and equipment.

END OF SECTION

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section includes procedures for ensuring optimal diversion of solid resources generated by the Work within the limits of the Construction Schedule, Contract Price, and available materials, equipment, and products. Construction waste management plan requirements to minimize waste disposed in landfills by maximizing reuse, salvage and recycling of waste materials.
 - 1. Participate in promoting efforts of the city to create a resource-efficient and environmentally sensitive structure and to effect optimum control of solid waste and recoverable resources generated in the Work.
 - 2. Refer to the latest issue of City's Waste Management Plan but the percentage of the waste diversion shall comply with the minimum requirements of this Section.

- B. The project requires a special solid resource management program.
 - 1. Project Goal: Divert a minimum of 75 percent (by weight in tons or volume in cubic yards) of total project waste from landfills.
 - 2. Provide documentation with end-of-project recycling rates, salvage rates and landfill rates demonstrating that at least 75 percent by weight or volume (units must be consistent throughout) of total construction wastes were salvaged or recycled.

- C. Related Sections: Documents affecting works of this Section include, but are not necessarily limited to, the following Specifications:
 - 1. Section 013542, CALGREEN REQUIREMENTS, waste management diversion.
 - 2. Section 018113, SUSTAINABLE DESIGN REQUIREMENTS, waste management diversion.
 - 3. Section 024119, SELECTIVE DEMOLITION, for demolition and removal of existing buildings and site elements as required for new work.
 - 4. Sections 31000, EARTHWORK, and 311000, SITE CLEARING, for basic site materials and methods.
 - 5. Section 328400, LANDSCAPE IRRIGATION, and Section 329000, PLANTING, for low water usage and native plantings.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.02 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Division I – Technical Requirements: Off-Site Improvements, Division J – Technical Requirements: Traffic Signals and Equipment, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.03 DIVERSION REQUIREMENTS

- A. Construction Waste Management – Divert 75 percent from Disposal
 1. Recycle and/or salvage a minimum 75 percent of non-hazardous construction and demolition debris. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume but must be consistent throughout.

1.04 DEFINITIONS

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Local Enforcement Agency (LEA).
- B. Construction and Demolition Waste: All non-hazardous solid resources resulting from construction, remodeling, alterations, repair, and demolition operations.
- C. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling. Includes Class III landfills and inert fills.
- D. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring, or others soils engineering operation.
- E. Inert Fill: A facility that legally accept inert waste such as asphalt and concrete exclusively for the purpose of disposal.
- F. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete, that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional Water Board pursuant to Division 7 (Section 13000 et seq.) of the California Water Code that does not contain significant quantities of decomposable solid resources.
- G. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- H. **Mixed Debris Recycling Facility:** A solid resources processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- I. **Permitted Waste Hauler:** A company that possesses a valid and current permit from the Los Angeles County Department of Public Health to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in the Los Angeles County.
- J. **Recycling:** The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- K. **On-site Recycling:** Materials that are sorted and processed for use in an altered form in the Work, (e.g., concrete is crushed for use as base for a parking lot on the site).
- L. **Off-site Recycling:** Materials hauled to a location and used in an altered form in the manufacture of a new product.
- M. **Recycling Facility:** An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a Solid Waste Facilities permit from the CIWMB or be regulated by the LEA.
- N. **Re-Use:** Materials that are recovered for use in the same form. This includes materials are used on-site or off-site. Refers also to Salvage Material, which are materials recovered for re-use and sold or donated to a third party.
- O. **Source-Separated Materials:** Materials that are sorted at the site of generation by individual material type for the purpose of recycling, i.e., loads of concrete that are source-separated for delivery to a base course recycling facility.
- P. **Solid Waste:** Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- Q. **Transfer Station:** A facility that can legally accept solid wastes for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal or recovering some materials for re-use or recycling. Transfer stations must be permitted by the CIWMB and regulated by the LEA.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.05 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification and waste reduction work plan. Indicate quantities by weight or volume but use same units of measure throughout waste management plan. Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion from landfill.
- B. Prior to beginning on-site work submit Waste Management Plan to Engineer, and City Project Manager using a form based on the sample form shown at the end of this Section.
- C. Waste management plan shall contain the following:
 - 1. Name of Contractor's personnel responsible for managing plan.
 - 2. Analysis of proposed jobsite waste to be generated, including types and approximate quantities. Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion from landfill. Per the LEED prerequisite, this requirement to include five materials in the plan is greater than the number of materials required to achieve the related LEED credits.
 - 3. Approximate a percentage of the overall project waste that these materials represent.
 - a. Alternative daily cover (ADC) does not qualify as material diverted from disposal. Include materials destined for ADC in the calculations as waste.
 - b. Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion.
 - 4. Landfill options:
 - a. Name of the landfill(s) where trash will be disposed.
 - b. Applicable landfill tipping fee(s).
 - c. Projected cost of disposing all Contract waste in landfill(s).
 - 5. Landfill Certification: Contractor's statement of verification that landfill proposed for use are licensed for types of waste to be deposited and have sufficient capacity to receive waste from Work.
 - 6. Recycling options: Provide the name and location of where the diverted materials will be taken and how the recycling facility will process the material. If on-site diversion strategies are not available, explain why.
 - 7. Recycling Certification: Contractor to select a recycling facility that is certified by the Recycling Certification Institute.
 - 8. Alternatives to Landfilling:
 - a. List of each material proposed to be salvaged, reused, or recycled. Specify whether materials will be site separated or commingled and describe the diversion strategies planned for the project.
 - b. Proposed local market for each material and estimated net cost savings or additional costs resulting from separating and recycling (versus landfilling). "Net" shall mean following have been subtracted from the cost of separating and recycling:

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- 1) Revenue from sale of recycled or salvaged materials.
 - 2) Landfill tipping fees saved due to diversion of materials from landfill.
- c. Following materials, at a minimum, shall be listed:
- 1) Demolition Waste:
 - a) Asphaltic concrete paving.
 - b) Concrete.
 - c) Concrete reinforcing steel.
 - d) Brick.
 - e) Concrete masonry units.
 - f) Piping.
 - g) Valves.
 - h) Sprinklers.
 - i) Electrical conduit.
 - j) Copper wiring.
 - k) Lighting fixtures.
 - l) Lamps.
 - m) Ballasts.
 - n) Electrical devices.
 - o) Switchgear and panelboards.
 - p) Transformers.
 - 2) Construction Waste:
 - a) Site-clearing waste.
 - b) Masonry and CMU.
 - c) Lumber.
 - d) Wood sheet materials.
 - e) Wood trim.
 - f) Metals.
 - g) Roofing.
 - h) Insulation.
 - i) Carpet and pad.
 - j) Gypsum board.
 - k) Piping.
 - l) Electrical conduit.
 - m) Beverage Containers.
 - n) Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - o) Paper.
 - p) Cardboard.
 - q) Boxes.
 - r) Plastic sheet and film.
 - s) Polystyrene packaging.
 - t) Wood crates.
 - u) Plastic pails.

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- d. Materials Handling Procedures:
 - 1) Description of procedures to be employed to prevent materials designated for landfill alternatives to be protected from contamination.
 - a) Waste separation procedures
 - b) Recycling methods to be employed
- e. Transportation:
 - 1) Description of means of transportation for materials to be recycled, reused, or salvaged.
 - a) Self-hauled.
 - b) Collected by waste hauler.

1.06 SUBMITTALS

- A. Waste Management Plan: One PDF of draft plan for review and three copies of printed final plan within 30 days of date established for the Notice to Proceed or prior to any waste removal, whichever occurs sooner.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment and with application for final payment, submit three copies of report. Failure to submit may delay progress payment. Submit a monthly waste management report for the project that include the following:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Types of waste material and quantity of each waste material in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. The report must address ADC and other materials that are included in the calculation even if they do not count toward diversion. If multiple haulers or diversion strategies are used, compile waste management information from all sources into a single report.
 - 7. Total quantity of waste diverted (salvaged plus recycled) in tons and diversion rates (percentage).
 - 8. Total quantity of waste diverted (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit PDF of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

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- F. Records of Reuse: Record of estimated weight or volume of materials that are reused on-site or salvaged for reuse on other projects by subcontractors or vendors.
- G. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Commingled Waste: Provide documentation complying with one of the following requirements:
 - 1. The waste-sorting facility provides a waste diversion percentage specific to the project's waste based on measurement of each component waste material. Visual inspection is not an acceptable method of evaluation for documenting this percentage.
 - 2. The waste-sorting facility's average diversion rate, which must be regulated by the local or state authority and must exclude alternative daily cover (ADC).
 - a. This must be a closed system; shipping waste to another municipality to manage does not count as diverting the waste.
- I. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- J. Contractor to prepare a tabulation of total waste material, quantities diverted and means by which it is diverted, documentation to back-up calculations (e.g., hauler receipts and weight tickets), and statement that requirements for the required diversion rates have been met.
- K. Submittals: Compliance Documentation
- L. Qualification Data: For Waste Management Coordinator.

1.07 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Include the Construction Waste Management Plan requirements in contract agreements with subcontractors.
- C. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

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2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Distribute copies of Waste Management Plan to Job Superintendent, Subcontractors, and City. One copy shall be posted on job site at all times.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used prior to, and at, appropriate stages of Work.
 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Separation facilities: Designate, as approved by City, specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas shall be kept neat and clean. Clearly mark bins to avoid contamination of materials.
- E. Hazardous wastes: Notify City if any hazardous wastes are encountered that were not identified prior to start of contract.
- F. Submit summary of waste as identified in submittals article above monthly.
- G. Remove waste materials in accordance with provisions of Contract Documents and in accordance with all applicable regulations. Arrange for the collection and hauling materials by a permitted waste hauler or using Contractor's own trucks.
- H. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

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1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 015000, TEMPORARY FACILITIES AND CONTROLS, for controlling dust and dirt, environmental protection, and noise control.
- I. Legally dispose of materials, which cannot be delivered to a source separated or mixed recycling facility, to a transfer station or disposal facility that can legally accept the materials for disposal.

3.02 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 2. Waste coordinator to regularly inspect containers and bins for contamination and remove contaminated materials if found.
 3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 4. Stockpile materials away from construction area. Do not store within drip line of trees.
 5. Store absorptive components off the ground and protect from the weather.
 6. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.03 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving:
1. Grind asphalt to maximum 44-inch size.
 2. Crush asphaltic concrete paving and screen to comply with requirements in Section 312313, EXCAVATION AND FILL, for use as general fill.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

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1. Pulverize concrete to maximum [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
 2. Crush concrete and screen to comply with requirements in Section 312313, EXCAVATION AND FILL, for use as satisfactory soil for fill or subbase.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
1. Pulverize masonry to maximum [3/4-inch (19-mm)] [1-inch (25-mm)] [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
 - a. Crush masonry and screen to comply with requirements in Section 312313, EXCAVATION AND FILL, for use as [general fill] [satisfactory soil for fill or subbase].
 - b. Crush masonry and screen to comply with requirements in Section 329000, LANDSCAPE PLANTING, for use as mineral mulch.
 2. Clean and stack undamaged, whole masonry units on wood pallets.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- L. Conduit: Reduce conduit to straight lengths and store by type and size.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

3.04 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For non-treated wood pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
 - 1. Comply with requirements in Section 329000, LANDSCAPE PLANTING, for use of chipped organic waste as organic mulch.
- C. Wood Materials:
 - 1. Clean Cut-Offs of Non-Treated Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329000, LANDSCAPE PLANTING, for use of clean sawdust as organic mulch.
- D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 329000, LANDSCAPE PLANTING, for use of clean ground gypsum board as inorganic soil amendment.

3.05 DISPOSAL OF WASTE

- A. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Burning: Do not burn waste materials.
- D. Disposal: Transport waste materials off Owner's property and legally dispose of them.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 4 - SAMPLE PROJECT FORM ATTACHMENTS

4.01 CONSTRUCTION WASTE DISPOSAL AND DIVERSION SUMMARY

- A. A sample form is provided for the Contractor's use on the following page. This form may be customized by Contractor as needed to show all necessary information.
- B. Contractor shall provide the actual submittal forms in electronic format.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

CONSTRUCTION WASTE DISPOSAL AND DIVERSION SUMMARY

Contractor Name: _____
 License Number: _____
 Contractor Address: _____

 Signature: _____
 Date: _____

1.0 CONSTRUCTION WASTE MATERIAL DETAILS

Solid Waste Material	Disposition Date or Dates	Material Amount (pounds)	Dispositions				
			Recycled	Salvaged	Reused	Hazardous	Landfill
Landfill Wastes							
Receiving Facility							
Name and Location							
Hazardous Wastes							
Receiving Facility							
Name and Location							
Material #1							
Receiving Facility							
Name and Location							
Material #2							
Receiving Facility							
Name and Location							
Material #X							
Receiving Facility							
Name and Location							

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

2.0 CONSTRUCTION WASTE MATERIAL SUMMARY

Construction Waste Disposition	Total Disposition (Cost \$)	Total Weight (Pounds)	Percentage of Total
Recycled Materials			
Salvaged Materials			
Reused Materials			
Hazardous Waste			
Landfill Waste			
TOTAL CONSTRUCTION WASTE			

END OF SECTION

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final Completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.03 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

SECTION 017700 – CLOSEOUT PROCEDURES

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.06 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Agency unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Specification Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Divisions 02 through 33 Specification Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Specification Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Agency's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Engineer of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Engineer. Advise Agency's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.

SECTION 017700 – CLOSEOUT PROCEDURES

4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Agency's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Engineer of changeover in heat and other utilities.
 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 8. Complete final cleaning requirements, including touchup painting.
 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.07 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Paragraph 1.09, Final Payment Requirements.
 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

SECTION 017700 – CLOSEOUT PROCEDURES

1.08 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
1. Organize list of spaces in sequential order, starting with exterior areas first.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in one of the following formats:
 - a. MS Excel electronic file. Engineer will return annotated file.
 - b. PDF electronic file. Engineer will return annotated file.
 - c. Three paper copies. Engineer will return two copies.

1.09 FINAL PAYMENT REQUIREMENTS

- A. Submittals prior to final payment: Provide the following prior to final payment.
1. Submit closeout submittals specified in other Division 01, GENERAL REQUIREMENTS, Specification Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, waste disposal receipts, and similar final record information.
 2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Sections. Obtain Engineer's signature for receipt of submittals.
 4. Submit test/adjust/balance records.

SECTION 017700 – CLOSEOUT PROCEDURES

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Agency's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Agency during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2- by 11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

SECTION 017700 – CLOSEOUT PROCEDURES

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.

SECTION 017700 – CLOSEOUT PROCEDURES

- k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - o. Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

SECTION 017700 – CLOSEOUT PROCEDURES

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 1. Operation and maintenance documentation directory.
 2. Emergency manuals.
 3. Operation manuals for systems, subsystems, and equipment.
 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems, and equipment.

1.03 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 SUBMITTALS

- A. Initial Submittal: Submit a draft PDF of each at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Engineer will return one copy of PDF and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit one copy of each manual in PDF form at least 15 days before final inspection. Engineer will return copy with comments within 15 days after final inspection.
 1. Correct or modify each manual to comply with Engineer's comments. Submit three printed copies of each corrected manual within 15 days of receipt of Engineer's comments.

SECTION 017823 – OPERATION AND MAINTENANCE DATA

1.05 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.

SECTION 017823 – OPERATION AND MAINTENANCE DATA

- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Agency.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Engineer.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into final printed and PDF sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2- by 11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2- by 11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual.

SECTION 017823 – OPERATION AND MAINTENANCE DATA

At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.

- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.

- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Agency's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.04 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.

SECTION 017823 – OPERATION AND MAINTENANCE DATA

8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross- reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.

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2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.

SECTION 017823 – OPERATION AND MAINTENANCE DATA

2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Agency's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

SECTION 017823 – OPERATION AND MAINTENANCE DATA

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Agency's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared Record Drawings in Section 017839, PROJECT RECORD DOCUMENTS.
- G. Comply with Section 017700, CLOSEOUT PROCEDURES, for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017836

WARRANTIES AND GUARANTEES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work includes:
 - 1. Furnish all labor, materials, tools, equipment, and services for all warranties and guarantees as indicated in accordance with provisions of Contract Documents.
 - 2. Completely coordinate with all other Contract work.
- B. In addition to 1-year General Guarantee, provide specified extended written warranties/guarantees for products and installations which exceed basic 1-year General Guarantee required by the Contract Documents.
- C. Provide manufacturer's warranties/guarantees for products.
 - 1. Where manufacturer's or other sub-tier entity's standard warranties/guarantees expire before expiration date required by Contract Documents, obtain and pay for extensions, as part of Contract Price.

PART 2 - PRODUCTS

2.01 WARRANTIES/GUARANTEES

- A. Assemble warranties/guarantees forms in 3-ring white binders, each with 3-inch spine, and clear sleeve on cover and spine. Completely index each binder with card stock indexing system identified by appropriate Construction Specifications Institute "Master Format" specification section numbering system, with each warranty/guarantee clearly labeled.
- B. Identify each warranty/guarantee in manner consistent with names and identification numbers used in Contract Documents.
- C. Neatly type or draft all warranties/guarantees not furnished in printed form.
- D. Furnish warranty documents, signed by indicated individuals and entities.

SECTION 017836 – WARRANTIES AND GUARANTEES

PART 3 - EXECUTION

3.01 DELIVERY

- A. Deliver all items to Agency for review within 30 calendar days after completion of the Work.
- B. Deliver all final and corrected items to Agency prior to acceptance of the Work.

END OF SECTION

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Administrative and procedural requirements for Project Record Documents, including the following:
 - a. Record Drawings.
 - b. Record Specifications.
 - c. Record Product Data.
- C. Related Sections:
 - 1. Section 013123, WEB-BASED CONSTRUCTION MANAGEMENT, for methods on storing and transmitting record documents.
 - 2. Section 017700, CLOSEOUT PROCEDURES, for general closeout procedures.
 - 3. Section 017823, OPERATION AND MAINTENANCE DATA, for operation and maintenance manual requirements.
 - 4. Section 019113, GENERAL COMMISSIONING REQUIREMENTS, for LEED and commissioning documentation requirements.
 - 5. Divisions 02 to 33 Specification Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.02 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal: One PDF electronic file of marked-up record prints, and one set of plots from corrected record digital data files. Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal: Submit PDF electronic files of marked-up record prints, one set of record digital data files, and two sets)of record digital data file plots. Plot each drawing file, whether or not changes and additional information were recorded.

SECTION 017839 – PROJECT RECORD DOCUMENTS

- B. Record Specifications: Submit one annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and one annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints:
 - 1. Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.
 - 2. Preparation:
 - a. Mark Record Prints to show the actual installation where installation varies from that shown originally.
 - b. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - c. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - d. Accurately record information in an understandable drawing technique.
 - e. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 3. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.

SECTION 017839 – PROJECT RECORD DOCUMENTS

- g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or ASI.
 - k. Changes made following Engineer's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 4. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately.
 - a. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - 5. Mark record sets with erasable, red-colored pencil.
 - a. Use other colors to distinguish between changes for distinct categories of the Work at same location.
 - 6. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 7. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer and Construction Manager. When authorized, prepare two (2) full sets of corrected digital data files of the Contract Drawings, as follows:
- 1. Set #1 Format: AutoCAD or Revit 2023, printed on mylar.
 - 2. Set #2 Format: Annotated PDF electronic file with comment function enabled.
 - 3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 4. Refer instances of uncertainty to Engineer through Construction Manager for resolution.
 - 5. Engineer will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. Refer to Section 013300, SUBMITTAL PROCEDURES, for requirements related to use of Engineer's digital data files.
 - b. Engineer will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings.

SECTION 017839 – PROJECT RECORD DOCUMENTS

Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer and Construction Manager.
 - e. Name of Contractor.

2.02 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as one annotated PDF electronic file(s) of the Specifications.

2.03 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as an annotated PDF electronic file(s) of marked Product Data.
 1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

SECTION 017839 – PROJECT RECORD DOCUMENTS

2.04 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned or annotated PDF electronic file(s) of marked up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples:
 - 1. Store paper record documents and samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes.
 - 2. Maintain paper Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss.
 - 3. Maintain PDF Record Documents on the Project Management Software with agency review access at all times.
 - 4. Provide access to paper Project Record Documents for Engineer's and Construction Manager's reference during normal working hours.

END OF SECTION

SECTION 017843

SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Work includes:
 - 1. Furnish all labor, materials, tools, equipment and services for all spare parts and maintenance materials as indicated in accordance with provisions of Contract Documents.

1.02 SUBMITTALS

- A. Requirements for submittal:
 - 1. Provide transmittal letter to Engineer containing: Date, project title, Contractor's name and address, title, description, and quantity submitted.
 - 2. Provide products, spare parts, maintenance, and extra materials in quantities specified in the individual specification sections.

PART 2 - PRODUCTS

2.01 SPARE PARTS AND TOOLS

- A. Contractor shall package in clearly identified boxes all spare parts and tools required in the individual Specifications Sections.
 - 1. Indicate manufacturer's name, part name and stock number, the piece of equipment by equipment number that each part or tool is for, and the name, address and phone number of closest supplier of the spare part or tool.

2.02 MAINTENANCE MATERIALS

- A. Contractor shall package in clearly identified boxes in accordance with manufacturer's recommendations, all maintenance materials required in the individual Specifications Sections.

SECTION 017843 – SPARE PARTS AND MAINTENANCE MATERIALS

1. Indicate material trade name and stock number, which item material is to be used with, and the name, address, and phone number of closest supplier.

2.03 EXTRA MATERIALS

- A. Contractor shall package in clearly identified containers or install where indicated. In accordance with manufacturer's recommendations, all extra materials required to be provided in the individual specification sections.
 1. Indicate trade name, stock number, size, and color, where product is to be used, and the name, address, and phone number of closest supplier.

PART 3 - EXECUTION

3.01 DELIVERY

- A. Deliver spare parts and materials at least 30 calendar days prior to final Acceptance.
- B. Deliver to a location at the project site and place in a location as directed by Engineer.

END OF SECTION

SECTION 017900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Agency's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.03 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit two complete training manuals for Agency's use.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

SECTION 017900 – DEMONSTRATION AND TRAINING

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000, QUALITY REQUIREMENTS, experienced in operation and maintenance procedures and training.
- B. Pre-Construction Conference: Conduct conference at Project site to comply with requirements in Section 013100, PROJECT MANAGEMENT AND COORDINATION. Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.05 COORDINATION

- A. Coordinate instruction schedule with Agency's operations. Adjust schedule as required to minimize disrupting Agency's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Engineer.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. Motorized doors and gates, including folding doors.
 - 2. Equipment, including residential appliances.
 - 3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
 - 4. Intrusion detection systems.
 - 5. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
 - 6. HVAC instrumentation and controls.

SECTION 017900 – DEMONSTRATION AND TRAINING

7. Electrical service and distribution including generator transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 8. Packaged engine generators, including transfer switches.
 9. Lighting equipment and controls.
 10. Communication systems, including intercommunication, voice and data, and television equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria.
 2. Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 3. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 4. Recording: All operational and maintenance demonstrations are to be recorded for use by the Owner. They are to be a professional quality recording. The goal of these recordings is for the Owners' maintenance staff to use them in the future to train new staff members.
 5. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 6. Operations: Include the following, as applicable:
 - a. Startup procedures.

SECTION 017900 – DEMONSTRATION AND TRAINING

- b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
7. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
8. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
9. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
10. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

SECTION 017900 – DEMONSTRATION AND TRAINING

- B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION AND RECORDINGS

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Videographer: Engage an experienced videography to document operational and maintenance presentations.
- C. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Engineer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- D. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 1. Schedule training with Owner, through Engineer, with at least 7 days advance notice.
- E. Training Location and Reference manual: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- F. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- G. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 018000
QUALITY ASSURANCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Work includes:
 - 1. Furnish all labor, materials, tools, equipment, and services necessary to meet requirements delineated.
 - 2. Completely coordinate with other Contract work.
 - 3. Perform additional work specified under respective Specification Sections.

1.02 SUBMITTALS

- A. Qualifications of Designers, Manufacturers, Fabricators, and Installers:
 - 1. Where individual Specification Sections require specific qualifications for manufacturer, fabricators, applicators, or installer; submit documentation substantiating the required qualifications of the organization or personnel proposed for the Work.
 - 2. Submit qualification documentation at least 30 calendar days prior to start of Work for the Specification Section which requires the qualification.
- B. Demonstration and Training
 - 1. Furnish preliminary instruction forms and instruction itinerary.
 - 2. Submit outline of instruction materials and proposed itinerary at least 30 calendar days prior to start of demonstration and training.
 - 3. Demonstration and training must be complete prior to release of withheld contract funds (see General Provisions).
- C. Commissioning
 - 1. Provide acceptance certification from manufacturer representative, suppliers and subcontractors for applicable Specification Sections.

SECTION 018000 – QUALITY ASSURANCE

PART 2 - PRODUCTS

2.01 DEFINITIONS AND PROCEDURES

- A. Manufacturer, Fabricator, and Installer Qualifications:
1. "Years" refers to the number of years of experience in the type of work specified in the individual Specification Sections listed in the attached report. If the installer, fabricator, or manufacturer is a corporation, the corporation must have been in force under its current name for at least the number of years listed. If elements of Contractor's installation are subcontracted, such subcontracted work shall be by Subcontractors with the necessary specialty contractor license(s). The experience requirements apply to the individuals in Contractor's organization performing the installation and those who are responsible for the design, fabrication, and manufacturing processes.
- B. Warranties:
1. No warranty documents or alternate warranty submittals prepared by the manufacturer or supplier or Subcontractor to the Contractor will be accepted by the Agency. Only the requirements of the Contract's General Guarantee, set out in the General Requirements Sections 6-8, are acceptable, as amended (where applicable) by Section 017823, OPERATION AND MAINTENANCE DATA.
 2. The warranty documents are to be signed by all individuals in the Contractor's procurement structure, including all levels from manufacturer through supplier through Subcontractor and Contractor.
- C. Demonstrations and Training:
1. Demonstration, training, and commissioning may be performed by Contractor contemporaneously, subject to Engineer's express pre-approval.
- D. Extended Service:
1. "Extended service" refers to the Contractor providing all labor, material, and equipment necessary to maintain, service and repair the equipment and materials under Specifications Sections concerned for the designated period commencing from the date of Acceptance of the Work.
 2. Contractor shall perform all scheduled maintenance and service work, including changing all filters and following all lubrication schedules and performing any necessary repairs to keep the equipment and/or materials in proper working order for the duration of the period noted.
- E. Commissioning:
1. Specifications sections that are designated as requiring commissioning obligate Contractor to cause an individual from the manufacturer's or fabricator's organization to come to the project site and start up the

SECTION 018000 – QUALITY ASSURANCE

equipment concerned to verify that it has been installed correctly and that it is running properly.

2. Contractor shall cause subject manufacturer's representative to accept, in writing, (as well as all other levels of the Contractor's procurement organization from manufacturer through supplier through Subcontractor and Contractor) that the equipment, materials, and systems have been properly installed and are functioning properly, and that a qualified manufacturer's representative has commissioned the equipment.

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE

- A. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- B. Satisfy additional requirements as described in individual Specification Sections.

END OF SECTION

SECTION 018113

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) **Silver** certification based on USGBC's LEED v4 BD+C.
 - 1. Specific requirements for LEED are also included in other Sections.
 - 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
 - a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.
 - 4. Definitions included in the "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Reference Guide and online amendments apply to this Section.
- B. Related Requirements:
 - 1. Section 013200, CONSTRUCTION PROGRESS DOCUMENTATION.
 - 2. Section 013300, SUBMITTAL PROCEDURES.
 - 3. Section 015000, TEMPORARY FACILITIES AND CONTROLS, for temporary heating and cooling requirements.
 - 4. Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.
 - 5. Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
 - 6. Section 017823, OPERATION AND MAINTENANCE DATA.
 - 7. Section 019113, GENERAL COMMISSIONING REQUIREMENTS.

SECTION 018113 – SUSTAINABLE DESIGN REQUIREMENTS

8. Divisions 02 through 49 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.03 DEFINITIONS

- A. **Bio-Based Materials:** Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.
- B. **CDPH Standard Method v1.1:** CDPH Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.
- C. **Chain-of-Custody:** A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.
- D. **Chain-of-Custody Certificates:** Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- E. **Composite Wood and Agrifiber:** Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, MDF, plywood, wheatboard, strawboard, panel substrates, and door cores.
- F. **Corporate Sustainability Report:** A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- G. **Environmental Product Declaration (EPD):** An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.
 1. **Product-Specific Declaration:** A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
 2. **Industry-Wide (Generic) EPD:** Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 3. **Product-Specific Type III EPD:** A product with a third-party certification, including external verification, in which the manufacturer is explicitly recognized by the program operator. EPD must conform to ISO 14025,

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14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

- H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.
- I. Health Product Declaration Open Standard: A standard format for reporting product content and associated health information for building products and materials.
- J. IAQ Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."
- K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.
- L. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.
- M. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.
- N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.
- O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.
 - 1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.
- P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- Q. Volatile Organic Compounds (VOC) Emissions Test: Those nonpolar and moderately polar organic chemicals with boiling points between 60°C and 290°C

SECTION 018113 – SUSTAINABLE DESIGN REQUIREMENTS

that are amenable to monitoring, based on sorbent collection /thermal desorption/GC/MS analysis. The volatility range of chemicals amenable to the method will depend on the sorbent cartridges and thermal desorption chromatographic system used by the laboratory.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC's final review of LEED certification.
 - 1. Provide documentation required by LEED and LEED review.
- B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.
- C. Respond to questions and requests for additional information from Architect and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.
- D. LEED Online Submittals: Upload LEED documentation submittal data directly to USGBC project "LEED Online" website. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.
- E. LEED Conference: Schedule and conduct a conference at a time convenient to Owner and Architect within 21 days prior to commencement of the work. Advise Architect, Owner's Commissioning Authority, Owner's Project Manager of scheduled meeting dates.
 - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owner's Project Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
 - 3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1.05 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.

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1. Submit each LEED submittal simultaneously with applicable product submittal.
- B. LEED Documentation Submittals:
1. General, Sustainable Materials Attributes Form: Project submittals must be accompanied by a completed Sustainable Materials Attributes Form. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the Sustainable Materials Attributes Form.
 - a. Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
 2. EAp3, Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance.
 3. MRp2/MRc5, Construction and Demolition Waste Management: Comply with submittal requirements of Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
 4. MRc2, Building Product Disclosure and Optimization: Environmental Product Declarations complying with LEED requirements (example is those found on www.ul.com/SPOT).
 5. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices.
 - a. Extended Producer Responsibility: Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
 - b. Bio-Based Materials: Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
 - c. Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
 - d. Materials Reuse: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
 - e. Recycled Content: Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement of costs.
 6. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
 - a. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting, including but not limited to the following:
 - 1) Manufacturer Inventory.
 - 2) UL Product Lens.
 - 3) Health Product Declaration.
 - 4) Cradle to Cradle certifications.
 - 5) Declare product labels.

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- 6) ANSI/BIFMA e3 Furniture Sustainability Standard.
7. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.
8. EQp2/EQc3/EQc4, IAQ: Comply with submittal requirements of Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.
9. EQc2, Low-Emitting Materials: Product data, indicating VOC content and GREENGUARD Gold certification or emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:
 - a. Paints and coatings.
 - b. Adhesives and sealants.
 - c. Flooring.
 - d. Products containing composite wood or agrifiber products or wood glues.
 - e. Ceilings, walls, thermal, and acoustic insulation.
 - f. Exterior applied materials.
 - g. Furniture (furniture may show some compliance with LEED requirements with GREENGUARD certification).

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:
 1. Wood construction materials.
 2. Furniture.
 3. Passive plumbing materials.
 4. Passive mechanical (HVAC) materials.
 5. Passive electrical materials.
 6. Earthwork and exterior improvements, hard costs.
- C. LEED Action Plan Components: Provide preliminary submittals within 10 days of date established for the Notice to Proceed indicating how the following requirements will be met:
 1. MRp2/MRc5, Waste management plan, complying with Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
 2. EQp2/EQ3/EQ4, Indoor air quality plan, complying with Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
 1. MRp2/MRc5, Waste reduction progress reports complying with Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

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2. MRc2, Building product disclosure and optimization – environmental product declarations.
3. MRc3, Building product disclosure and optimization – sourcing of raw materials.
 - a. General: Manufacturing locations.
 - b. Option 1: Corporate sustainability reports.
 - c. Option 2:
 - 1) Extended producer responsibility.
 - 2) Bio-based materials.
 - 3) Certified wood products.
 - 4) Materials reuse.
 - 5) Recycled content.
4. MRc4, Building product disclosure and optimization – material ingredients.
5. EQc2, Low emitting materials.
 - a. Low Emitting Materials Tracking Sheet monitoring the project's progress towards targeted LEED Indoor Environmental Quality Credits. Tracking Sheet to be presented at construction meetings. Alternatively, you could utilize the free feature on www.ul.com/SPOT to track this in My Projects.
6. EQc3, Indoor air quality, during construction, complying with Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.
7. EQc4, Indoor air quality assessment, complying with Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.

1.07 Quality Assurance

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.
 1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.

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2.02 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

- A. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1. Provide at least 20 permanently installed products (sourced from at least five different manufacturers) which meet one of the disclosure criteria:
1. Product-Specific Declaration: Valued as one-quarter of a product.
 2. Industry-Wide (Generic) EPD: Valued as one-half of a product.
 3. Product-Specific Type III EPD: Valued as one whole product (product-specific EPDs found on www.ul.com/SPOT are automatically in this area).
- B. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices. Provide products that meet at least one of the responsible extraction criteria below for at least 25 percent, by cost, of the total value of permanently installed building products in the project:
1. Extended producer responsibility program.
 2. Bio-based materials.
 3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
 - a. Rough carpentry.
 - b. Miscellaneous carpentry.
 - c. Heavy timber construction.
 - d. Wood decking.
 - e. Metal-plate-connected wood trusses.
 - f. Structural glued-laminated timber.
 - g. Finish carpentry.
 - h. Architectural woodwork.
 - i. Wood paneling.
 - j. Wood veneer wall covering.
 - k. Wood flooring.
 - l. Wood lockers.
 - m. Wood cabinets.
 - n. Furniture.
 4. Recycled content.
 - a. Exceptions: Do not include furniture, fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.
- C. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
1. Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1 percent (1,000 ppm), which meet one of the following disclosure criteria:
 - a. Manufacturer Inventory.

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- b. UL Product Lens
 - c. Health Product Declarations.
 - d. Cradle to Cradle certifications.
 - e. Declare product labels.
 - f. ANSI/BIFMA e3 Furniture Sustainability Standard.
- D. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.
- 1. Use products that document their material ingredient optimization using the paths below for at least 25 percent, by cost, of the total value of permanently installed products in the project, which meet one of the following disclosure criteria:
 - a. GreenScreen benchmarks.
 - b. Cradle to Cradle certifications.
 - c. REACH optimizations.

2.03 LOW-EMITTING MATERIALS

- A. EQc2, Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant with GREENGUARD Gold certification. This certification shows compliance with the LEED criteria of showing that the product meets CDHP, Standard Method v1.1-2010, using the applicable exposure scenario. Manufacturer's documentation demonstrating compliance must state the range of Total VOCs (TVOCs) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:
- 1. 0.5mg/m³ or less,
 - 2. between 0.5 and 5.0 mg/m³, or
 - 3. 5.0 mg/m³ or more.
 - 4. GREENGUARD Gold certified products are automatically listed as having their TVOC at 0.5 mg/m³ or less and can be found at www.ul.com/SPOT
- B. EQc2, Low-Emitting Materials, Paints and Coatings: For field applications [that are inside the weatherproofing system], use paints and coatings that comply with the limits for VOC content when calculated according to the CARB 2007, Suggested Control Measure for Architectural Coatings, or the SCAQMD Rule 1113, effective June 3, 2011.

Product Type	Allowable VOC Content (g/L)
Bond Breaker	350
Clear wood finishes – Varnish	275
Clear wood finishes – Sanding sealer	275
Clear wood finishes – Lacquer	275
Colorant – Architectural coatings, excluding IM coatings	50
Colorant – Solvent Based IM	600
Colorant - Waterborne IM	50
Concrete – Curing compounds	100

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Product Type	Allowable VOC Content (g/L)
Concrete – Curing compounds for roadways and bridges	350
Concrete surface retarder	50
Driveway sealer	50
Dry-fog coatings	50
Faux finishing coatings – Clear topcoat	100
Faux finishing coatings – Decorative Coatings	350
Faux finishing coatings – Glazes	350
Faux finishing coatings – Japan	350
Faux finishing coatings – Trowel applied coatings	50
Fire-proof coatings	150
Flats	50
Floor coatings	50
Form release compounds	100
Graphic arts (sign) coatings	150
Industrial maintenance coatings	100
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – Non-sacrificial anti-graffiti coatings	100
Industrial maintenance coatings – Zinc rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-color coatings	250
Non-flat coatings	50
Pre-treatment wash primers	420
Primers, sealers and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	100
Stone consolidant	450
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Swimming pool coatings – repair	340
Swimming pool coatings – other	340

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Product Type	Allowable VOC Content (g/L)
Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood preservatives	350
Low solids coatings	120

- C. EQc2, Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of GREENGUARD Gold certification. This certification shows compliance with the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. EQc2, Low-Emitting Materials, Adhesives and Sealants: For field applications[that are inside the weatherproofing system], use adhesives and sealants that comply with the limits for VOC content when calculated according to SCAQMD Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005:

Architectural Applications	Allowable VOC Content (g/L)
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Dry wall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single ply roof membrane adhesives	250
Specialty Applications	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Computer diskette manufacturing	350
Contact adhesive	80
Special purpose contact adhesive	250
Tire retread	100

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Architectural Applications	Allowable VOC Content (g/L)
Adhesive primer for traffic marking tape	150
Structural wood member adhesive	140
Sheet applied rubber lining operations specialty	850
Top and Trim adhesive	250
Substrate Specific Applications	
Metal to metal substrate specific adhesives	30
Plastic foam substrate specific adhesives	50
Porous material (except wood) substrate specific adhesives	50
Wood substrate specific adhesives	30
Fiberglass substrate specific adhesives	80
Sealants	
Architectural sealant	250
Marine deck sealant	760
Nonmember roof sealant	300
Roadway sealant	250
Single-ply roof membrane sealant	450
Other sealant	420
Sealant Primers	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
Other sealant primer	750
Other	
Other adhesives, adhesive bonding primers, adhesive primers or any other primers	250

- E. Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.
- F. EQc2, Low-Emitting Materials, Adhesives and Sealants: For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants shall comply with the requirements of GREENGUARD Gold certification. This certification shows compliance with the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. EQc2, Low-Emitting Materials, Flooring: Flooring shall comply with the requirements of GREENGUARD Gold certification. This certification shows compliance with the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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- H. EQc2, Low-Emitting Materials, Composite Wood: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the CARB "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- I. EQc2, Low-Emitting Materials, Ceilings, Walls, Thermal, and Acoustic Insulation: Ceilings, walls, and thermal insulation shall comply with the requirements of GREENGUARD Gold certification. This certification shows compliance with the CDPH "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. Additional Low-Emitting Requirements:
 - 1. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1 percent weight by mass (total exempt compounds) must be disclosed.
 - 2. If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
 - 3. Methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

PART 3 - EXECUTION

3.01 NONSMOKING BUILDING

- A. EQp2, Environmental Tobacco Smoke Control: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.
 - 1. Refer to Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.

3.02 CONSTRUCTION WASTE MANAGEMENT

- A. MRp2 MRc5, Construction and Demolition Waste Management: Comply with Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

3.03 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. EQc3/EQc4, Construction Indoor Air Quality Management Plan: Comply with Section 015731, INDOOR AIR QUALITY (IAQ) MANAGEMENT.

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LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

Project Name: Long Beach Fire Station 9
Date: 10/30/2020

Y	?	N	Description	Points	Cost	Compliance Remarks, Action Items
1	0	0	Credit Integrative Process	1		LEED kick-off, water and energy models be developed at concept design
8	4	20	Location and Transportation	16		
0	0	16	Credit LEED for Neighborhood Development Location	16		N/A
1	0	0	Credit Sensitive Land Protection	1		Project located in previously developed site
1	0	1	Credit High Priority Site	2		Located in a U.S. Department of Housing and Urban Development's Qualified Census Tract (QCT) or Difficult Development Area (DDA)
2	2	1	Credit Surrounding Density and Diverse Uses	5		Likely, there are more than 8 diverse uses with 1/2 mile walking distance of project.
1	2	2	Credit Access to Quality Transit	5		LEED v4.1 compliance path recommended. Bus route 51 within 1/4 mile walking distance. Metro route 60 within 1/4 mile walking distance. Transit routes total 72 weekday trips and 44 weekend trips.
1	0	0	Credit Bicycle Facilities	1		4 min long-term and 4 min short-term bicycle storage spaces required. Bike storage within 100 feet of any main entrance. At least 1 shower required. Within 200-yard of 10 services.
1	0	0	Credit Reduced Parking Footprint	1		>40% reduction in parking spots. ITS recommended value = 56 stalls, planned parking = 16 stalls. Project will achieve exemplary performance >60% reduction.
1	0	0	Credit Green Vehicles	1	\$	16 spaces x 5% = 1 space identified as green vehicles and 16 spaces x 2% = 1 space with Level 2 EVSE. Note that the city of Long Beach requires 5% of EVSE to be installed and 25% to be planned.
4	3	3	Sustainable Sites	10		
Y			Prereq Construction Activity Pollution Prevention	Required		Comply through CALGreen
1	0	0	Credit Site Assessment	1		Need Phase I and II Environmental Site Assessment (ESA).
0	1	1	Credit Site Development - Protect or Restore Habitat	2	\$	Project can comply with Option 2 by providing financial support to a land trust. Cost for Option 2 is \$6,986.00 (\$0.40/SF) considering total site area.
0	0	1	Credit Open Space	1		Project won't comply. Need to show 30% = 5,239 sq. ft. open space, project has only 3,515 sq. ft. of qualifying open area.
0	2	1	Credit Rainwater Management	3		LEED v4.1 option is now 80% and 85% percentile storms which is easier and depends upon onsite stormwater plan. <u>More study needed.</u>
2	0	0	Credit Heat Island Reduction	2		Project will comply project materials include cool roof and permeable concrete paving.
1	0	0	Credit Light Pollution Reduction	1		Comply through CALGreen. Need to meet CALGreen BUG ratings and outside signage.
5	3	3	Water Efficiency	11		
Y			Prereq Outdoor Water Use Reduction	Required		Comply through CALGreen
Y			Prereq Indoor Water Use Reduction	Required		Comply through CALGreen
Y			Prereq Building-Level Water Metering	Required		Comply through CALGreen
1	1	0	Credit Outdoor Water Use Reduction	2		Comply through CALGreen (1 point, Option 1). Irrigation system to show 50% potable water savings.
4	1	1	Credit Indoor Water Use Reduction	6		Currently at 41% reduction considering low-flow urinals and metered faucets in public restrooms.
0	0	2	Credit Cooling Tower Water Use	2		N/A. No cooling tower in the project. Cooling Tower ACP is not recommended. It usually drop energy points down, not a desirable trade off.
0	1	0	Credit Water Metering	1	\$	Need 2 submetering system in addition to main building metering. <u>More study needed.</u>
18	10	5	Energy and Atmosphere	33		
Y			Prereq Fundamental Commissioning and Verification	Required	\$\$	Comply through CALGreen. Need to develop an OPR and BOD, Cx specification and bid out to qualified Cx providers.
Y			Prereq Minimum Energy Performance	Required		Comply through CALGreen
Y			Prereq Building-Level Energy Metering	Required		Comply through CALGreen
Y			Prereq Fundamental Refrigerant Management	Required		Comply through CALGreen
4	0	2	Credit Enhanced Commissioning	6	\$\$	Project most likely will include Enhanced and Monitoring Cx
10	8	0	Credit Optimize Energy Performance	18	\$\$	Comply through CALGreen (1 point, Option 1). Best practices on MEP design should drive performance 20% better than ASHRAE 90.1. Additional points estimated based on experience with previous fire station projects. <u>More study needed.</u>
0	1	0	Credit Advanced Energy Metering	1	\$	Need to confirm that at least end uses (lighting, HVAC, plug loads) representing 10% or more of consumption will be submetered. <u>More study needed.</u>
0	0	2	Credit Demand Response	2		N/A. Not feasible. Fire Stations are essential services and need to fully operate at all times.
2	1	0	Credit Renewable Energy Production	3	\$\$\$	Assuming solar PV system to offset 5% of building's energy use based on previous fire station projects. <u>More study needed.</u>
0	0	1	Credit Enhanced Refrigerant Management	1		Based on previous fire station projects, most likely project won't comply.
2	0	0	Credit Green Power and Carbon Offsets	2	\$	Will need to purchase RECs through eGreen merchant or Virtual PPA program.

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3 5 5 Materials and Resources				13	
Y		Prereq	Storage and Collection of Recyclables	Required	Comply through CALGreen
Y		Prereq	Construction and Demolition Waste Management Planning	Required	Comply through CALGreen
0	1	4	Credit	Building Life-Cycle Impact Reduction	5 \$ Under LEED v4.1 project can achieve 1 pt by providing preliminary calculations, no reduction in LCA required for 1 pt <u>More study needed.</u>
1	1	0	Credit	Building Product Disclosure and Optimization - Environmental Product Declara	2 Under LEED v4.1, Option1 EPDs should be feasible, Option 2 multi-attribute is harder to achieve but can with UL SPOT. UL will distribute submittal coversheets to collect relevant information from subcontractors.
0	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2 Under LEED v4.1, Responsible sourcing of materials, 20% by cost 1 point, 40% by cost another point. Might get both but won't know until procurement. UL will distribute submittal coversheets to collect relevant information from subcontractors
1	1	0	Credit	Building Product Disclosure and Optimization - Material Ingredients	2 Under LEED v4.1, Option 1 Material Ingredient Reporting now easier to achieve. Option 2 still difficult to achieve but maybe available by time procurement for this project. UL will distribute submittal coversheets to collect relevant information from subcontractors
1	1	0	Credit	Construction and Demolition Waste Management	2 Comply through CALGreen (1 point, Option 1). Need to document 50% C&D waste diversion rates for four different waste streams. Note that the City of Long Beach requires 65%, project will comply
8 5 3 Indoor Environmental Quality				16	
Y		Prereq	Minimum Indoor Air Quality Performance	Required	Comply through CALGreen. Determine minimum outdoor air intake flow using the ventilation rates in ASHRAE 62.1-2010
Y		Prereq	Environmental Tobacco Smoke Control	Required	Comply through CALGreen. Non-smoking building and need signage and designated smoking area at least 25 feet from building opening.
1	1	0	Credit	Enhanced Indoor Air Quality Strategies	2 \$ Likely to achieve. Additional point available if project includes increased ventilation and CO2 monitoring <u>More study needed.</u>
2	1	0	Credit	Low-Emitting Materials	3 Need to design and document low VOC adhesives, sealants, coatings, certified flooring, and low VOC/certified furniture. Should achieve at least 3 categories (i.e., paints & coatings, flooring, and insulation).
1	0	0	Credit	Construction Indoor Air Quality Management Plan	1 Comply through CALGreen. Prepare comprehensive IAQ management plan.
1	1	0	Credit	Indoor Air Quality Assessment	2 \$ Assuming flush-out. Additional point can be earned with air quality testing (est. \$8K fee) at the end of construction.
1	0	0	Credit	Thermal Comfort	1 Likely to achieve. Provide individual thermal comfort controls for at least 50% of individual occupant spaces. Provide group thermal comfort controls for all shared multi-occupant spaces.
1	1	0	Credit	Interior Lighting	2 Likely to achieve. Provide individual lighting controls for at least 90% of individual occupant spaces in staff areas.
0	1	2	Credit	Daylight	3 \$\$ Daylight simulation is required. Under LEED v4.1, need to show that more than 55% of spaces achieve 300-3000 lux of daylight <u>More study needed.</u>
1	0	0	Credit	Quality Views	1 Most likely will comply, all occupied spaces have windows.
0	0	1	Credit	Acoustic Performance	1 N/A. Not included in the project. Unlikely to achieve.
5 1 0 Innovation				6	
4	1	0	Credit	Innovation	5 Innovation points are available through pilot credits (Verified C&D Recycling Facility), exemplary performance (e.g. 60% Reducec Parking) and innovation measures (e.g. Green Cleaning, Green Education, Moisture Control Plan) <u>More study needed.</u>
1	0	0	Credit	LEED Accredited Professional	1 UL has a number of LEED AP BD+C's on staff
3 1 0 Regional Priority				4	
1	0	0	Credit	Regional Priority: Reduced Parking Footprint	1
1	0	0	Credit	Regional Priority: Optimize Energy Performance 10 pts	1
1	0	0	Credit	Regional Priority: Indoor Water Use Reduction 4pts	1
0	1	0	Credit	Regional Priority: Rainwater Management	1 Additional point available if SSc rainwater management is achieved <u>More study needed.</u>
55	32	39	TOTALS	Possible Points: 110	Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

END OF SECTION

SECTION 019113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Commissioning Plan.
- C. Pre-Functional Checklists.
- D. Functional Performance Test Procedures.

1.02 SUMMARY

- A. Section Includes:
 - 1. Commissioning Team.
 - 2. Commissioning Meetings.
 - 3. Construction Checklist Overview.
 - 4. Controls Verification.
 - 5. Functional Performance Testing.
 - 6. Training Development.
 - 7. Commissioning Plan.
- B. Related Sections:
 - 1. Section 220000, PLUMBING.
 - 2. Section 230000, HEATING, VENTILATION AND AIR CONDITIONING
 - 3. All applicable provisions of the remaining divisions also apply to this Section.

1.03 DEFINITIONS

- A. A/E: Architect/Engineer of Record.
- B. BoD: Basis of Design. A document, prepared by Engineer, that records concepts, calculations, decisions and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

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- C. Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources and documentation requirements of the commissioning process.
- D. Contractor: Construction Manager, General Contractor and Subcontractors.
- E. CxA: Commissioning Authority.
- F. EOR: Engineer of Record.
- G. FPT: Commissioning Functional Performance Test.
- H. OPR: Owner's Project Requirements. A document prepared by Owner that details the functional requirements of a Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria and supporting information.
- I. PFC: Commissioning Pre-functional Checklists.
- J. Systems, Assemblies, Equipment and Components: Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, equipment and components.
- K. TAB: Testing, Adjusting and Balancing.

1.04 DESCRIPTION

- A. The Owner has elected to use the Commissioning Process as part of their quality assurance process to design, construct and operate this building. As with any quality process, Commissioning provides tools to enable everyone involved in the construction of a building to verify the final building meets the original intent of the Owner. A primary tool used is the completion of pre-functional checklists by individual workers. The checklists are simple to fill out and easily track the current state of work by providing the key criteria in the specifications the Owner has defined as important for the successful installation and long-term operation of systems and equipment.
- B. A key component of Commissioning is the testing and verification of both the function and the operating performance of commissioned heating, cooling, ventilation, lighting and landscape irrigation systems in all modes of operation to ensure the building is ready for year-round occupancy.
- C. Commissioning provides focused training of operation and maintenance personnel by ensuring that detailed training agendas are utilized and requiring detailed submittal requirements from Contractors prior to accomplishing any training.

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- D. The commissioning scope of work shall encompass all new mechanical, electrical and plumbing systems.

1.05 INCLUDED SYSTEMS

- A. The following systems and their components are the focus of the Commissioning Process due to their complexity and the need to have coordination among the various contractors:
 1. Gas Storage Domestic Water Heater (WH).
 2. Circulation Pump (CP).
 3. Expansion Tank (ET).
 4. Ductless Split System Cooling Only (DS).
 5. Exhaust Fan (EF).
 6. Vehicle Exhaust Fan (VEXF).
 7. Energy Recovery Ventilator (ERV).
 8. Gas Fired Unit Heater (UH).
 9. Intake Hood (IH).
 10. VRF Fan Coil/Heat Recovery Condensing Unit (FC/HRC).
 11. VRF Heat Recovery Box (BS).
 12. HVAC Controls.
 13. Interior Lighting Controls.
 14. Exterior Lighting Controls.
 15. Irrigation Controls.
 16. Solar Photovoltaic Panels.

1.06 SCHEDULE

- A. The Contractor shall provide a detailed construction schedule within 30 days of the commencement of work and at least 20 weeks prior to the Cx Construction Phase Commissioning Kickoff Meeting. The Contractor shall also provide CPM/schedule updates throughout the construction period. The Contractor's schedule shall include placeholders and adequate time periods for the completion of all commissioning activities identified in the Commissioning Schedule. This includes but may not be limited to CxA documentation submittals; CxA Pre-functional Checklists, reviews and verification, CxA witnessing of start-up activities and reviews; CxA reviews of ductwork and piping pressure and leakage testing, pipe flush-out and chemical treatments; CxA review of Test, Adjust and Balance reports and TAB verification; Functional Performance Testing and Retesting, Systems Manual narratives and Owner training. The Architect will provide the Contractor with commissioning activities to include into the overall project schedule.
- B. The Contractor shall notify the Architect 14 days prior to equipment startups and procedures, ductwork leakage and pressure testing, pipe leakage and pressure testing, system flush-outs and water treatment certification and AHJ inspections.

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All documentation shall be sent to the Architect of Record and CxA using the submittal process established by specifications.

- C. Contractor shall provide schedule allowances for completing all questions and required documentation uploads appearing in the Cx pre-functional checklists and installation checklists daily. The contractor shall return consolidated comments of Cx pre-functional checklists developed by the CxA within 14 days of receipt. Cx Functional performance testing will not be scheduled prior to Architect approving trends.
- D. Contractor shall complete pre-functional checklists and installation checklists daily.
- E. Contractor shall provide coordinated shop drawings monthly or as requested to verify that all trades are coordinating in a reasonable and logical manner.
- F. Contractor shall provide schedule allowances for CxA reviews of all completed startup reports as a condition of completing Cx Checklists. Cx functional performance testing shall not be scheduled until the CxA has reviewed and approved all startup reports of commissioned systems. Startup reports shall be submitted to the CxA and Architect of Record using the submittal process established by specifications.
- G. Contractor shall submit proposed startup procedures for review 14 days prior to startup.
- H. Contractor shall submit completed startup reports prior to scheduling functional testing.
- I. Contractor shall submit trending for review 7 days prior to functional performance testing. Trending duration shall be for 7 days on 30-minute intervals and shall include all points as requested by CxA. Functional testing will not be scheduled prior to Architect approving trends.
- J. Contractor shall provide schedule allowances for CxA and Architect of Record reviews of BAS trend reports consisting of 7 days (168 hours) of continuous building automation system controls monitoring on 15-minute intervals. During the trending period, commissioned systems utilizing local controls and those monitored and controlled by the building automation system shall not be in HAND Mode but be trended in AUTOMATIC Mode and according to the programmed building schedule. Trend reports shall include all points monitored and controlled by the building automation system and as requested by CxA. Cx Functional performance testing shall not be scheduled prior to the Owner and CxA approval of provided trend reports. Trend reports shall be submitted to the CxA and Architect of Record using the submittal process established by specifications.
- K. Contractor shall provide schedule allowances for CxA reviews of all interim and Final TAB Reports to the CxA and Architect of Record concurrently. A TAB report

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shall not be considered to be a Final TAB Report unless the report includes measurements and settings for all airside and waterside systems combined, complies with the TAB requirements in the project specifications manual, is certified by the TAB Contractor and is approved by the Engineer of Record. The Contractor shall be responsible for providing demonstration to the CxA of 10 percent of all TAB measurements during Cx TAB Verification.

- L. Contractor shall be responsible for 10 percent TAB Verification.
- M. Contractor shall provide schedule allowances for the successful demonstration, including initial FPT testing and required FPT retesting, to the CxA of commissioned systems and equipment through Cx Functional Performance Test procedures developed by the CxA (see paragraph 3.13). The contractor shall return consolidated comments of Cx functional performance test procedures developed by the CxA within 14 days of receipt. Contractor shall provide schedule allowances to resolve FPT deficiencies found through Cx initial testing/demonstration and provide schedule allowances for FPT retesting of failed test procedures.
- N. Contractor shall be responsible for participating in functional performance testing at end of construction, opposite season testing and at 10-month warranty review.
- O. Contractor shall submit O&M Manuals and warranties within 30 days of receiving approved product submittals and shop drawings.
- P. Contractor shall submit Training Materials and Agendas 30 days prior to scheduled training.
- Q. Contractor shall provide schedule allowances for CxA reviews of Systems Manual narratives provided by the installing Contractors. System Manual narratives shall be provided to the CxA for review at least 30 days prior to substantial completion.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 COMMISSIONING TEAM

- A. The Contractor and each subcontractor shall designate a single individual to be responsible for coordinating Cx activities, providing Cx documentation and Cx issues log responses and resolutions with Owner and CxA.
- B. The members of the commissioning team consist of Owner, Owner O&M personnel, Prime Contractor, either the General Contractor (GC) or the

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Mechanical Contractor (MC), the Electrical Subcontractor(s) (ES), the Plumbing Subcontractor (PC) the Testing Adjusting and Balancing (TAB) Subcontractor, the Controls Subcontractor (CS), Landscape Irrigation Subcontractor (LI) and the Commissioning Authority (CxA).

3.02 COMMISSIONING MEETINGS

- A. All commissioning team members shall attend organized Cx meetings. Cx meetings shall discuss the Cx process, Cx Issues Log resolutions, scheduled activities, documentation and other Cx team responsibilities and deliverables.
- B. Commissioning meetings will be held throughout the duration of construction and will typically follow a scheduled project coordination meeting. Commissioning meetings will be separate from other meetings and will have their own agenda and meeting minutes. The CxA will lead, distribute agendas and record meeting minutes for Cx meetings. The meetings are not to be redundant to other meetings and will be to discuss quality issues and commissioning activities.

3.03 COMMISSIONING PLAN

- A. A detailed commissioning plan containing the OPR, designer's Basis of Design document (if available), commissioned systems, commissioning team, roles and responsibilities, Cx activities and documentation requirements, commissioning schedule and a compilation of all test forms and training requirements will be provided and reviewed with the subcontractors during the pre-construction workshop.
- B. The commissioning plan is intended only as a guide for commissioning activities on the project. The specifications are the contract requirements and shall be considered the extent of the subcontractor's responsibilities.

3.04 DOCUMENTATION

- A. All commissioning documentation shall be sent to the Architect for record.

3.05 SUBMITTAL REVIEWS

- A. The Commissioning Authority (CxA) shall review submittals concurrent to the Architect. The intent of this review is to identify long-term issues of submitted equipment and to ensure the original design intent is maintained throughout the design and construction phases. Comments of the CxA will be coordinated through the Architect. The focus of the CxA review will be:
 - 1. Verify that the equipment or system meets the Owner's Project Requirements.

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2. Verify that equipment or system includes provisions for access and maintenance.

3.06 CONSTRUCTION CHECKLIST OVERVIEW

- A. The intent of the construction checklist is to provide a formalized means to easily track construction progress and to provide individual workers' the key criteria for a successful installation.
 1. Pre-functional checklists are described in detail below. These are equipment-specific.
 2. Checklists for piping, ductwork, cable trays, wiring, etc. are different from the pre- functional checklists. Although they are not formally tracked, they will be used by the CxA during periodic site observations. These checklist items are reminders to the contractors of some common items that have been problematic on other projects.
- B. Construction checklists for all pieces of equipment typically follow the same format yet are tailored to the specific equipment being installed.
- C. Pre-functional and Construction checklists are developed for each individual piece of equipment to track and verify equipment from when they are delivered, installed and started up. The contractor will be provided with all checklists developed for each piece of equipment or system and the following:
 1. Instructions and Checklist Procedures.
 2. Checklists with the following sections:
 - a. Pre-Installation Checks: Includes several yes/no or short answer questions to document the condition of the equipment prior to installation and several blank columns to compare delivery items such as manufacturer, model, serial no., etc. to the corresponding submitted/approved items.
 - b. Installation and Startup: Includes several yes/no or short answer questions to document that the equipment is installed, electrically wired, controlled and started up and balanced according to the specified requirements. A Negative Responses section is included at the end of the checklist to document the reasons for any "no" responses or discrepancies in the various sections. A space is included to document the actions taken to correct the problems resulting in "no" responses.
- D. Sections and information responses required in Cx Checklists.
 1. Cx Checklists will include the following sections for the Contractor to complete:
 - a. Contractor Installation Sheets: Contractor shall upload all installation sheets and startup sheet documentation.
 - b. General: Contractor shall provide installed equipment condition, report damage and the location provided.

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- c. Equipment Verification: Contractor to provide all manufacturer, model number and serial numbers contained in each individual checklist.
 - d. Installation: Contractor shall confirm the completion of all checklist installation question items.
 - e. Equipment Photo: Contractor to upload completed installation photo of equipment item and unit Tag Number in each individual checklist.
- E. The construction checklists shall be distributed by the supervisor to individual workers (teams) at the start of each day for the equipment or system to be installed or worked on that day.
- F. The checklist shall be completed by the individual actually completing the work. Prior to any work, the checklist shall be reviewed by the individual contractor for pertinent information. Any negative responses on the checklist shall be explained and documented at the end of the checklist. The CxA will review each checklist with the respective contractor(s) prior to the installation of the first component of an item, e.g., the first unit heater, to ensure they understand the use of the checklist.
- G. All Installation Checklists shall be returned to the supervisor upon completion of the work at the end of each day. The CxA will retrieve completed checklists and retain for documentation, progress will be documented by CxA and distributed to the Cx Team.
- H. The completion of the checklist does not eliminate the contractor's responsibility for meeting other requirements in the specifications and drawings.
- I. The CxA will periodically verify the accuracy, completeness and tracking of the checklists. If consistent errors are found, the responsible contractor shall re-validate 100 percent of the checklists for the problem equipment or system type.
- J. The Checklists are designed to detect and eliminate delivery, installation and startup problems and problems with miscommunication. This process also serves as a convenient way to document the progress of the work and avoid the invalidation of manufacturer warranties.

3.07 SITE OBSERVATION AND ISSUES LOG

- A. The CxA will perform routine site observations during the construction period.
- B. The CxA will maintain an Issues Log that will include construction issues, access and maintenance issues, safety issues, or other issues. Each observation is intended to improve the project quality and achieve the OPR.
- C. The CxA Issue Logs are not substitutions for Engineer or Architect of Record Punch Lists and can supplement reviews performed by other project teams. The

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CxA Issue Logs focus on systemic problems. Where an issue is identified, not all of the same components will have been verified by the CxA.

- D. The contractor shall provide written responses to all issue item comments in the Cx Issue Log within 7-days of when the issue was identified by the CxA. Issues shall not be considered resolved or closed by the CxA until written response comments by the responsible party are provided in the Cx Issues Log and the proposed resolution is acceptable by the Owner and CxA.

3.08 START-UP

- A. Start-up plans shall be prepared prior to start-up and submitted to the Architect for A/E, Owner and CxA review.
- B. Start-up documentation shall contain a minimum of all start-up procedures recommended by manufacturer and shall encompass all accessories and sensor calibration.
- C. Completed start-up reports shall be submitted within 7 days of startup completion and prior to scheduled functional performance testing. Start-up reports shall be type written on contractor's letterhead and provided electronically to the CxA for review and approval.
- D. Cx functional performance testing shall not be scheduled prior to Architect and CxA approving start-up documentation.

3.09 O&M MANUALS

- A. O&M Manuals and Warranties shall be submitted to the Architect for Owner and CxA review.
- B. Distribution process shall be the same as Submittal Review established in the project specifications manual.
- C. O&M manuals shall be provided to the CxA at least 30 days prior to the Cx functional performance testing. Cx functional performance testing shall not be scheduled prior to Architect and CxA approving start-up documentation.
- D. The O&M manuals shall include every piece of equipment, assemblies and associated control and building operating system components. See Section 017700, CLOSEOUT PROCEDURES, for more detail.

3.10 TRAINING

- A. The contractor is responsible for the development of the training material for the system. The contractor shall utilize the Operations and Maintenance Manual as

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a basis for instruction. Any coordination of training between different subcontractors is the responsibility of the contractor.

- B. The contractor shall submit the training agendas and material to the Architect 30 days prior to the originally scheduled system training for review and acceptance for review. The CxA shall provide comments to supplement the training material for operations and maintenance personnel where appropriate. Training Agendas shall include:
1. Instructor and organization name.
 2. Date of training.
 3. Duration.
 4. Individual topics covered.
 5. General purpose of the system.
 6. Use of the O&M manuals.
 7. Review of control shop drawings, electrical drawings and schematics.
 8. Instruction on all modes of operation: building schedules, start-up procedures, purge modes, optimal start and stop, morning warm up and cool down periods, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting and alarms.
 9. Controls set-up, trending and programming, troubleshooting, notifications of system safeties, alarms and how to reset, e.g., manual and/or automatic resets.
 10. Interactions with other systems, adjustments and optimizing methods for energy conservation, relevant health and safety issues.
 11. Periodic and preventative maintenance procedures and schedules. Schedules should be broken out by system and each component requiring maintenance.
 12. Special maintenance requirements; recommended spare parts lists; and replacement component resources.
 13. Interactions with local and BAS control systems and mitigating control issues.
 14. Tenant interaction issues.
 15. Discussion of how the feature or system is environmentally responsive to outside air conditions.
 16. The trainer shall verify that the training agenda is covered and shall obtain signatures and names of persons attending the training.
- C. CxA will review training agenda and materials concurrent with Owner and A/E.
- D. Distribution process shall be the same as Submittal Review.
- E. Training shall be recorded by the Contractor with three copies supplied to Owner in DVD format.
- F. All training sessions shall be scheduled and coordinated by the Contractor through Owner.

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- G. Major component training shall be completed and accepted by Owner prior to substantial completion and occupancy.

3.11 CONTROL SYSTEM VERIFICATION

- A. Included in this work will be sample-based verification of instrument calibration, access to components, Cx remote access to building automation system, labeling of devices, clear sequences and shop drawings.
- B. The verification of the control system will be accomplished as an on-going task during construction to identify and resolve systemic issues early in the project. This on-going task will involve work that occurs offsite and throughout the construction phase including the closeout phase.
- C. The control system operation must be sufficiently operational prior to the TAB of the system. It is understood that a portion of the final control system startup occurs in conjunction with the TAB work. The intent of this requirement is for the TAB work to be productive and not be hampered by a control system that is not sufficiently functional.
- D. The control system testing will utilize the controls system instrumentation for testing. Therefore, the first portion of the control system testing will be verification of the sensors, inputs and outputs.
- E. Point-to-Point Verification: All wiring shall be checked out by the Contractor from end to end, point to point, from field to computer screen to ensure correct connection and a system free from wiring defects.
- F. Building Automation System (BAS) Trending Verification: Provide seven consecutive days (168 hours) of all control points monitored by the building automation system to the CxA for review and comment prior to functional testing. Any issues observed with BAS trend reports will be recorded in the Cx Issues Log. After issues are corrected, an additional seven consecutive days (168 hours) of re-trending shall be provided to the CxA for review. Verification of trending will be established after all BAS monitored control points are demonstrated for seven consecutive days.
- G. CxA verification of sensors will be made using the sampling method; an exhaustive re-test of the control system inputs and outputs will not be conducted by the CxA. Prior to CxA verification, the Contractor shall be responsible for complete input/output checkout quality assurance.
 - 1. Sensor and Actuator Calibration, General:
 - a. This section is included to emphasize the importance of the Contractor calibrating the instrumentation and to make clear the requirement for same; and that “factory calibration” or “calibration by exception” is not acceptable.

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- b. All field-installed temperature, relative humidity, CO, CO₂, pressure sensors and gauges, and all actuators, i.e., dampers and valves, on all equipment shall be calibrated using the methods described below. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
 - c. All procedures used shall be fully documented on the pre-functional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
2. Sensor Calibration Methods:
- a. All Sensors and Transducers. Verify that all sensor and transducer locations are appropriate and away from causes of erratic operation. Verify that sensors and transducers with shielded cable are grounded only at one end.
 - b. Sensors without Transmitters. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor is within the specified tolerances. If not, install offset in BAS, calibrate or replace sensor.
 - c. Sensors with Transmitters. Connect a signal generator. Adjust transmitter zero and span to match the signal generator until the ammeter reads 4 mA. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading is within the specified tolerances. If not, replace sensor and repeat.
 - d. Sensor Tolerances. The following are the tolerances of the actual sensors in the system. Unless noted differently on the CxA test procedure, use the following:
 - 1) Temperature (space or room): +/- 1.0 deg F.
 - 2) Temperature (duct): +/- 0.5 deg F.
 - e. Valve and Damper Stroke Setup and check as follows:
 - 1) For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
 - 2) Set pumps or fans to normal operating mode (If the system could be affected by this, then shut down the system). Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is fully open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position does not reasonably correspond, replace actuator.
 - 3) Closure for normally closed valves and dampers (spring-loaded only). Disconnect power to the actuator motor and verify the valve or damper moves to full closed position. If not spring-loaded, conduct verification by disconnecting the signal wire. Restore to normal.

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- 4) Closure for normally open valves and dampers (spring-loaded only). Disconnect power to the actuator motor and verify the valve or damper moves to full-open position. If not spring-loaded, conduct verification by disconnecting the signal wire. Restore to normal.

3.12 TEST, ADJUST, AND BALANCE REVIEW AND VERIFICATION

- A. The CxA shall review the TAB activities performed by the Contractor to document achievement of the OPR. The specific activities expected include:
 1. Contractor shall provide all interim and Final TAB Reports to the CxA and Architect of Record for concurrent review. A TAB report shall not be considered to be a Final TAB Report unless the report includes measurements and settings for all airside and waterside systems combined, complies with the TAB requirements in the project specifications manual, is certified by the TAB Contractor and is approved by the Engineer of Record.
 2. CxA will review TAB deficiencies report with Owner to evaluate existing conditions and repairs that may be required.
 3. Review of TAB procedures during process. TAB Contractor shall verify accessibility of equipment and components required for TAB work, adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces, adequate number and placement of balancing valves to allow proper balancing and recording of water flow, adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both tab and commissioning testing.
 4. Review of TAB report after TAB work is complete. Contractor shall meet with Cx Team and Owner prior to submitting final TAB report to verify TAB accuracy. The verification will be done by TAB contractor with the same equipment used to balance the system. 10 percent of all balanced components will be verified to be in compliance. If any component is found to be out of compliance, the TAB contractor shall be responsible to correct and provide another 10 percent TAB verification. Verification will include hydronic and air-side equipment, air distribution devices, etc.
 5. The TAB verification will be done while the system is under automatic control. The control system, VFDs, etc. shall not be manually controlled during verification.

3.13 FUNCTIONAL PERFORMANCE TESTING

- A. The CxA will witness tests performed by the Contractor that are intended to document achievement of the OPR. The specific activities expected include:

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1. Cx Functional Performance Testing shall not be scheduled or conducted until the following Cx activities have been completed and approved by the Owner and CxA.
 - a. Cx Checklist completion and field verification.
 - b. Commissioned systems startup sheets.
 - c. TAB review and verification.
 - d. Control systems verification and trend reporting.
 - e. Resolutions to Cx Issues Log items affecting functional performance testing.
 - f. Submittals of commissioned systems Operating and Maintenance Manuals.
 - g. Submittals of Owner O&M training plans and procedures.
 - h. Systems Manual narratives.
 2. The CxA will provide to all commissioning team members and others, as required, the functional performance test plan prior to scheduled testing.
 3. Review of test procedures: the contractor shall review the FPT procedures developed by the CxA. The contractor shall return consolidated comments from all subcontractors within 14 days of receipt.
 4. FPTs shall be accomplished prior to submitting the initial request for substantial completion and after all construction checklists have been accepted by the CxA and after acceptance of all startup and performance test reports, e.g., TAB report.
 5. Contractor shall assign adequate personnel and tools for the following FPTs and any required retests:
 - a. HVAC Systems – All modes of operation, including emergency, efficiency, performance and consistency tests.
 - b. Electrical – Review of HVAC equipment electrical connections to validate power quality within specified tolerances in all modes of operation, including emergency, efficiency, performance and consistency tests. Review lighting control systems in all modes of operation.
 - c. Plumbing Systems – Review of HVAC equipment plumbing connections, i.e., hot water, chilled water, condensate drainage, etc., in all modes of operation, including emergency, efficiency, performance and consistency tests.
- B. The Contractor and applicable subcontractors will be responsible to assist the CxA by witnessing the testing, putting the system in various modes of operation and fixing minor problems found during the test.
- C. Contractor shall be responsible for functional performance testing at end of construction, opposite season testing and at 10-month warranty review
- D. If major problems are discovered during the test, the Contractor will fix the problem and the test shall be redone. If more than two functional performance tests are required, the Contractor will be back-charged for the CxA's time and expenses.

SECTION 019113 – GENERAL COMMISSIONING REQUIREMENTS

- E. Control system set-up, calibration and operation shall be completed and verified prior to system adjusting and balancing as defined in Section 230000, HEATING, VENTILATION, AND AIR CONDITIONING. System functional performance testing shall not be completed until the Adjusting and Balancing report has been verified and accepted by the Architect/CxA.
- F. Skilled technicians shall be provided by the appropriate Contractor familiar with the system and building to execute the functional performance testing of the control system and perform functional performance testing of equipment. The Owner reserves the right to reject any technician who is not qualified to perform the required testing. Qualifications of technicians include site-specific expert knowledge relative to tested equipment and adequate documentation and tools to service and operate the systems.

3.14 RECORD DRAWINGS

- A. Contractor shall be responsible for providing coordinated shop drawing submittals to verify that all trades are coordinating in a reasonable and logical manner.

END OF SECTION

DIVISION 02
EXISTING CONDITIONS

SECTION 024113
SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 Related Documents:

- A. Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SECTION INCLUDES

- A. Demolition of site elements and existing buildings including all footings and related attachments, all paving and underlayment and utilities.
- B. Refer to Civil Demolition Plan and Section 311000, SITE CLEARING, for additional information.
- C. Protect existing site elements and trees noted to be protected in place.
- D. Specific structures/site elements to be demolished include:
 - 1. Existing Commercial Building.
 - 2. Existing Site Walls and Raised Planters, Concrete Stairs and Landings.
 - 3. Existing Site Electrical Systems.
 - 4. Above and below grade utilities.

1.03 RELATED SECTIONS

- A. Comply with Division 01, General Requirements.
- B. Section 311000, SITE CLEARING: Paving, utility, and debris removal.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.

SECTION 024113 – SELECTIVE SITE DEMOLITION

- B. Existing Conditions: Submit photographs of existing conditions of existing trees prior to beginning demolition work.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction. Provide “Record Documents” indicating the locations upon completion of the work.
- D. Imported Material: Soil material that is imported in from off-site areas for backfill.

1.05 PROJECT CONDITIONS

- A. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 312311, EXCAVATION AND FILL, and per the Geotechnical Report.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Survey of Existing Conditions: Record existing conditions of existing trees by preconstruction photographs in digital format.

3.02 SCOPE

- A. Refer to Demolition Drawings for demolition notes, structures, and appurtenances indicated for demolition.
- B. Demolish all portions of the existing buildings, including utilities serving the buildings. Remove all footings and back fill per specification Section 311000, SITE CLEARING. Cap or plug piping with same or compatible piping material.
- C. Demolish existing electrical site lighting and related electrical service panels, all conduits and wiring; including pole mounted fixtures, poles, and foundation systems.

SECTION 024113 – SELECTIVE SITE DEMOLITION

- D. Remove landscaping and irrigation, fences, gates, paving, walks, trash enclosures, and site walls (unless noted to be protected in place).
- E. Remove other items indicated for salvage, relocation, and recycling.
- F. Relics, antiques, and similar objects remain the property of the City. Notify the Architect prior to removal and obtain acceptance regarding method of removal. Relics and antiques may include:
 - 1. Commemorative plaques.
 - 2. Discovered historical remains or artifacts.
- G. Remove and dispose of all other materials.
- H. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits. Including but not limited to encroachment permits for work done within the City Right-of-Way.
 - 2. Use of explosives is not permitted.
 - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 4. Provide, erect, and maintain temporary barriers and security devices to ensure safe passage of people around the demolition area.
 - 5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 7. Do not close or obstruct roadways or sidewalks without permit.
 - 8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exists at any time; protect persons using entrances and exits from removal operations.

SECTION 024113 – SELECTIVE SITE DEMOLITION

9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect adjacent property improvements.
- D. Protect site elements that are not to be removed.
 1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
 4. If elements shown to be protected are damaged, they are to be repaired to original condition or replaced.
 5. For trees shown to remain, provide temporary protective barrier (minimum 4-foot-high chain link fence around each tree. Fencing to be constructed at the edge of drip line. Protect root zones of trees from vehicular traffic, parking, storage of materials or products, and dumping of refuse or chemically injurious materials or liquids. Carefully supervise excavation, grading and filling, and subsequent construction operations to prevent damage. Provide water for continued growth.
- E. Perform demolition in a manner that maximizes salvage and recycling of materials.
 1. Dismantle existing construction and separate materials.
 2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- F. Partial Removal of Paving and Curbs. Neatly sawcut at right angle to surface.
- G. Salvage and reinstall all traffic signs that require temporary removal to accommodate new construction within the public right-of-way.

3.04 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.

SECTION 024113 – SELECTIVE SITE DEMOLITION

- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.05 DEBRIS AND WASTE REMOVAL

- A. Remove and dispose debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

DIVISION 03
CONCRETE

SECTION 030000
CONCRETE WORK – GENERAL

PART 1 - GENERAL

1.01 APPLICABLE SECTION

- A. Submit Shop Drawings, Product Data, Mill Certificates and Samples required by other portions of Contract Documents. The requirements/provisions of the General and Supplementary Conditions and Division 01 Specification Section shall apply to this section.

1.02 DESCRIPTION OF WORK

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, and installing concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
1. All formwork, including any special forms necessary to produce architectural details and/or to accommodate the work of others and removal of forms.
 2. All concrete reinforcement, placement, bending and forming thereof.
 3. All concrete and cement finishing; all surface treatment and curing, including non-slip finishes and color work.
 4. Installation of all reglets, bolts, anchors, cans, sleeves, column anchor bolts, etc., whether furnished under this section or by others (except cans and sleeves required under the Electrical and Mechanical Divisions).
 5. The furnishing of all items required to be or shown on the drawings as embedded in concrete, which are not specifically required under other sections.
 6. Setting headers and screeds. Curing and protecting concrete.
 7. Grouting of column bases.
 8. Inserts, sleeves, cans, etc. required under the Plumbing, Mechanical, and Electrical Divisions 22, 23, and 26 respectively.
 9. Routing out cracks and sawcutting control joints as required by waterproofing.

SECTION 030000 – CONCRETE WORK

PART 2 - PRODUCTS - See other portions of specifications.

PART 3 - EXECUTION

3.01 DEFECTIVE WORK

- A. General: Work considered to be defective may be ordered by the Architect to be replaced in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to, the following:
- B. Reinforcing:
 - 1. Kinks and bends therein which are not scheduled or indicated on the drawings; reinforcing improperly placed, or previously heated, or excessively cold worked reinforcing.
- C. Concrete:
 - 1. Concrete in which defective or inadequate reinforcing steel has been placed.
 - 2. Concrete incorrectly formed or not conforming to details and dimensions on the drawings or with the intent of these documents, or concrete the surfaces of which are out of plumb or level.
 - 3. Concrete below specified strength.
 - 4. Concrete not meeting the maximum allowable drying shrinkage requirements.
 - 5. Concrete containing wood, cloth, or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.02 CORRECTION OF DEFECTIVE WORK

- A. The Contractor shall, at his expense, make all such corrections and alleviation measures as directed by the Engineer.
- B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings, shall be chipped out until all unconsolidated material is removed.
- C. Secure approval of chipped-out areas before patching. Patch per ACI 301.

END OF SECTION

SECTION 031000
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 APPLICABLE SECTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, installing, and removing form work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
1. Design of Formwork, Shoring and Falsework
 2. Construction and removal of all forms.
 3. Installation of items furnished under other sections but indicated therein to be installed under this section.
 4. Accuracy of installation is responsibility of section furnishing item.
- C. Related Work Specified Elsewhere:
1. Section 032000, REINFORCING STEEL
 2. Section 033000, CAST-IN-PLACE CONCRETE

1.03 REFERENCE STANDARDS

- A. The following is a list of Reference Standards referred to in this portion of the Specification:
1. W.C.L.I.B.; "Standard Grading and Dressing Rules No. 17."
 2. American Concrete Institute Standard ACI 347 "Guide to Formwork for Concrete" and ACI 318 "Building Code Requirements for Reinforced Concrete." Latest edition.
 3. California Building Code, current governing edition.
 4. American Plywood Association, "U.S. Product Standard PS1-09."

SECTION 031000 – CONCRETE FORMWORK

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.
 - 1. California Building Code, current governing edition.
 - 2. ACI-347 "Guide to Formwork for Concrete," current edition.
 - 3. State of California Department of Transportation Standard Specifications, current governing edition.

1.05 SUBMITTALS

- A. General Requirements
 - 1. Submittals shall be made to Architect in accordance with the requirements of Division 01, General Requirements, of these specifications.
 - 2. Construction, and fabrication or ordering of materials for formwork shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work as required in these specifications.

1.06 SEQUENCING AND SCHEDULING

- A. The Contractor shall obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete.

PART 2 - PRODUCTS

2.01 FORMS

- A. Plywood shall be 5/8" Exterior "B.B." Plyform Class I. Each sheet shall be grade stamped with an APA stamp.
- B. Sheathing shall be Douglas Fir "Standard" grade per Grading Rules #17, W.C.L.I.B., Paragraph 118-c. 1x6 shiplap S4S.
- C. Hardboard shall be 1/8-inch tempered.

2.02 SPREADERS

- A. Spreaders shall be of metal type that will give positive tying and accurate spreading.

SECTION 031000 – CONCRETE FORMWORK

2.03 STUDS, WALES AND SHORING

- A. Studs, wales, and shoring shall be Douglas Fir "Construction" grade per Grading Rules #17, W.C.L.I.B. Paragraph 122-b or "No. 2" grade, Paragraph 123-c.

2.04 MANUFACTURED ASSEMBLIES

- A. Manufactured assemblies may be used as forms provided that maximum loadings and deflections used on jacks, brackets, columns, joists and other manufacturer devices does not exceed the manufacturer's recommendations.

PART 3 - EXECUTION

3.01 GENERAL

- A. Furnish and install all forms, clamps, accessories, etc., required for all poured-in-place concrete below grade and unexposed portions above grade. Where sides of excavations have been cut neat and accurate to size for pouring of concrete directly against the excavation, forms for footings will not be required. Where the face of excavation is more than 3 inches wider than the specified width formwork shall be used.
- B. Furnish and install all forms, clamps, sealer, accessories, etc., required for all poured-in-place concrete above grade that will be exposed.
- C. Provide crack control and keyed cold joint forms.

3.02 DESIGN AND CONSTRUCTION OF FORMWORK

- A. Forms shall be constructed of sound material, of the correct shape and dimension, mortar tight, and of sufficient strength, and so braced and tied together that the movement of equipment, men, materials, or placing and vibrating the concrete will not throw them out of line or position. Construct so that they may be easily removed without damage to the concrete. Any movement or bellying of forms during construction shall be considered just cause for their removal and, in addition, the concrete work so affected. All formed joints on concrete surfaces to be exposed shall be taped and shall align so joints will not be apparent on the concrete surfaces. All dirt, chips, sawdust and other foreign matter shall be completely removed before concrete is placed.
- B. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly coated with an approved form sealer. The form sealer shall be of

SECTION 031000 – CONCRETE FORMWORK

high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete.

- C. Form supports shall be placed on adequate foundations and have sufficient strength and bracing to prevent settlement or distortion from the weight of the concrete or other cause. Support shall rest on double wedged shim, or other approved means, so that the forms will be maintained at the proper grade.
- D. Form Ties: Bolts, rods, or other approved devices shall be used for internal form ties and shall be of sufficient quantities to prevent spreading of the forms. The ties shall be placed at least 1 inch away from the finished surface of the concrete. The use of ties consisting of twisted wire loop will not be permitted. Bolts and rods that are to be completely withdrawn shall be coated with grease.
- E. Form Stakes: Where used, form stakes shall be smooth metal, coated as required to allow for removal from hardened concrete. Wood form stakes are not permitted. Fill voids left by form stake removal with non-shrink grout.

3.03 PLUMBING, LEVELING, REPAIRING AND MAINTAINING FORMS

- A. Before concrete is placed in any form, the horizontal and vertical position of the form shall be carefully verified and all inaccuracies corrected. All wedging and bracing shall be completed in advance of placing of concrete.
- B. Boards or other form materials that have been damaged or checked or warped prior to placing of concrete shall be removed from the forms and replaced with approved materials or otherwise corrected to the satisfaction of the engineer.
- C. Assign a sufficient number of men to keep watch on and maintain the forms during placing of concrete. Satisfactorily remedy any displacement or looseness of forms or reinforcement before placing of concrete. No form shall be moved or altered except as may be specifically directed.

3.04 FIELD QUALITY CONTROL

- A. The Contractor shall verify accuracy of items, furnished under other sections of these specifications and installed under this section.

3.05 REMOVAL OF FORMWORK, FALSEWORK AND SHORING

- A. Formwork, falsework, and shoring shall not be removed until the concrete members have acquired sufficient strength to support their weight and the loads to be superimposed thereon safely.

SECTION 031000 – CONCRETE FORMWORK

- B. The contractor is solely responsible for the design, installation, and removal of temporary bracing and construction supports required to complete the project. No portion of the structure shall be considered to be self-supporting until the entire vertical and lateral load resisting system is in place.
- C. Vertical forms shall remain on columns, walls, pilasters, etc., for at least seven (7) days.
- D. The Contractor shall request to have field cured compression test specimens taken for any concrete where it is planned to remove formwork, falsework, or shoring sooner than indicated above.
- E. In removing plywood forms, no metal pinch bars shall be used and special care to be taken in stripping. Start at top edge or vertical corner where it is possible to insert wooden wedges. Wedging shall be done gradually and shall be accompanied by light tapping of the plywood panels to crack them loose. Do not remove forms with a single jerk after it has been started at one end.
- F. Forms shall be left in place as long as possible to permit shrinkage away from concrete and plywood forms shall be left in place until all other forms around are stripped and until there is no danger of damaging the architectural concrete due to other work in the vicinity.
- G. Nothing herein shall be construed as relieving the contractor of any responsibility of the safety of the structure.
- H. After stripping, properly protect all concrete to be exposed in the finish work from damage with boards and building paper to prevent staining, spoiled edges, chips, etc.
- I. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured by one of the methods specified in Section 033000, CAST-IN-PLACE CONCRETE.

3.06 CLEAN UP

- A. Clean up shall be per special conditions. Failure to perform clean up within 24 hours' notice by the Architect shall be considered adequate grounds for having the work done by others at the contractor's expense.

END OF SECTION

SECTION 032000
REINFORCING STEEL

PART 1 - GENERAL

1.01 APPLICABLE SECTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing all reinforcing bars, ties, spacing devices, inserts, and all other material required to complete installation, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom.
- B. Work Included:
1. Fabricating and installing all reinforcing steel for cast in place concrete and unit masonry.
 2. Fabrication of reinforcing steel dowels to be embedded in existing concrete and existing masonry.
- C. Related Work Specified Elsewhere:
1. Section 031000, CONCRETE FORMWORK
 2. Section 033000, CAST-IN-PLACE CONCRETE
 3. Section 037010, POST-INSTALLED ANCHORS
 4. Section 042200, CONCRETE UNIT MASONRY

1.03 REFERENCE STANDARDS

- A. The following is a list of Reference Standards referred to in this portion of the specifications:
1. ASTM A184/A184M, Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
 2. ASTM A615, "Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement."

SECTION 032000 – REINFORCING STEEL

3. ASTM A706, "Specification for Deformed and Low-Alloy Steel Bars for Concrete Reinforcement."
4. ASTM A970, "Specification for Headed Steel Bars for Concrete Reinforcement."
5. ASTM A1064, "Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete."

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all applicable Federal, State and Local Code and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. ACI 315R, "Guide to Presenting Reinforcing Steel Design Details," latest edition.
 2. ACI 318, "Building Code Requirements for Structural Concrete," latest edition.
 3. AWS D1.4, "Structural Welding Code- Steel Reinforcing Bars," latest edition.
- B. Mill Certificates: The Contractor shall provide Mill Certificates for reinforcing steel in accordance with the requirements of Part 1.05, Submittals, of this specification section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05, Submittals, of this specification section.
- C. Sampling, Testing, and Inspection:
 1. General
 - a. All materials and work shall be subject to inspection at the mill, the fabrication shop, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
 - b. If the City's agent, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
 2. City: The City shall employ an independent testing laboratory as the City's agent to perform the sampling, testing and inspections shown on the contract drawings, and submit certified test results.
 3. Contractor:
 - a. The Contractor shall cooperate with and notify City's agent at least 24 hours in advance of inspections required and shall provide samples, test pieces, and facilities for inspection without extra charge.
 - b. The Contractor shall identify each lot of fabricated reinforcing steel to be shipped to the site by assigning an individual lot number that

SECTION 032000 – REINFORCING STEEL

identifies steel by heat number and shall be tagged in such a manner that each such lot can be accurately identified at the job site.

- c. The Contractor shall remove all unidentified reinforcing steel, anchorage assemblies and bar couplers received at the site.

1.05 SUBMITTALS

A. General Requirements:

1. Submittals shall be made to Architect in accordance with the requirements of Division 01, General Requirements, of these specifications.
2. Construction, fabrication, or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

B. Shop Drawings:

1. Shop Drawings shall be submitted that show diagrammatic elevations of all walls, footings, columns, beams, slabs, etc., at a scale sufficiently large to show clearly the positions and erection marks of reinforcing bars, their dowels, and splices.
2. Use same bar marks on diagrammatic elevations as used on the bar schedule.
3. Shop drawings shall also show details for congested areas and connections.
4. Shop Drawings used in field must be reviewed copies.
5. Contract drawings shall not be reproduced in whole or in part. Contract drawings modified into shop drawings will be returned without review.
6. Revised submittals shall have clear indications of revised or new information. Clouding is an acceptable form of identification.

C. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following items intended for use on project:

1. Mechanical anchorage devices for butt splices.

D. Mill Certificates:

1. The Contractor shall provide Mill Certificates for each size of bar for each heat to be used on project.
2. Mill Certificates shall include name of mill, date of rolling, date of shipping to fabricator and shall be signed by fabricator certifying that each material complies with or exceeds the specified requirements. A Mill Certificate shall be furnished with each lot of material delivered to the project and the lot shall be clearly identified in the Certificate.
3. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance and provide laboratory test reports. The Contractor shall pay for the cost of testing.

SECTION 032000 – REINFORCING STEEL

- E. Laboratory Test Reports:
 - 1. Laboratory test reports shall show the name of testing agency; date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California.
 - 2. When required by other portions of these specifications, laboratory test reports shall be submitted for each size of bar tested for each heat to show compliance with appropriate ASTM Standards and these specifications.

1.06 STORAGE OF MATERIALS

- A. Store reinforcement during fabrication and at site to avoid excessive rusting or coating with grease, oil, dirt, or other objectionable materials.

1.07 SEQUENCING AND SCHEDULING

- A. Coordinate work with all trades so as not to interfere with the work of other trades. Bring interferences between trades to Architect's attention and resolve before any concrete is placed.

PART 2 - PRODUCTS

2.01 REINFORCING BARS

- A. Bars for reinforcement listed below shall conform to the requirements of ASTM A706, Grade 60, except as allowed in ACI 318 Section 20.2.2.5.
 - 1. Vertical Bars, Columns & Pilasters
 - 2. Vertical and Horizontal Bars in Shear Walls, Coupling Beams, and Footings
 - 3. All Reinforcing Bars to be Welded or Field Bent
 - 4. All elements identified in ACI 318 Table 20.2.2.4a
- B. Bars for reinforcement not noted above shall conform to the requirements of ASTM A615, Grade 60.

2.02 WIRE

- A. All wire for concrete reinforcement shall conform to ASTM A1064.
- B. Holding wire for fusion welding shall conform to ASTM A1064.

SECTION 032000 – REINFORCING STEEL

2.03 WELDED WIRE FABRIC

- A. All wire fabric mesh shall conform to ASTM A1064.

2.04 WELDING ELECTRODES

- A. Welding electrodes shall be per Table 5-1 of AWS D1.4.

2.05 MECHANICAL COUPLING DEVICES

- A. Mechanical coupling devices shall develop 125 percent of the minimum yield strength of the bars spliced.

2.06 OTHER MATERIALS

- A. All other materials, not specifically described by these specifications but required for complete and proper placement of reinforcement shall be new, first quality of their respective kinds, and subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

- A. Prior to all work of the section, carefully inspect the installed work of other trades and verify that all work is sufficiently complete to permit the start of work under this section and that the completed work of this section will be in complete accordance with the original design and the reviewed shop drawings. In the event of discrepancy, immediately notify the Architect/Engineer in writing.
- B. In the event conduits, pipes, inserts, sleeves, or any other items interfere with placing the reinforcement as indicated on the drawings or approved shop drawings, or as otherwise required, immediately notify the Architect/Engineer and obtain approval on procedure before placement of reinforcement is started.

3.02 Fabrication

- A. Bends for reinforcing steel shall be made in accordance with ACI 318 latest edition. Bend all bars cold. Do not field bend reinforcing steel in a manner that will injure material, cause the bars to be bent on too tight a radius, or that is not indicated as allowed on drawings or permitted by Engineer. Do not straighten bent or kinked bars for use on project without permission of Engineer. Replace bars with kinks or bends not shown on the drawings.

SECTION 032000 – REINFORCING STEEL

- B. The use of fusion welding for attaching carrying wires to the foundation rebar work is acceptable with the following provisions:
 - 1. Fusion welding shall be to the stirrups and is not allowed to longitudinal reinforcing steel.
 - 2. Fusion welding of holding wires shall not occur on a bent portion of a reinforcing bar. After holding wire has been fusion welded to a reinforcing bar, that bar may not be bent where the fusion weld occurs.
 - 3. All reinforcing steel to be welded shall comply with ASTM A706.
 - 4. The welding process shall be as outlined in ASTM A1064.
 - 5. The contractor shall submit a complete shop welding program outlining the type of the specific fusion welding machine.
 - 6. Fusion welding shall have periodic special inspection of the in-plant welding, including review of the setup of the machine prior to the start of welding and testing of samples.

3.03 PLACING

- A. All reinforcement shall be placed in strict conformity with the requirements of the engineering drawings, both as to location, position and spacing of members. It shall be supported and secured against displacement by the use of adequate and proper wire supporting and spacing devices, tie wires, etc. so that it will remain in its proper position in the finished structure.
- B. Preserve clear space between parallel bars of not less than 1-1/2 times the nominal diameter of round bars and in no case let the clear distance be less than 1-1/2 inches nor less than 1-1/3 times the maximum size of aggregate for concrete. Bars placed in shotcrete shall have a minimum clearance between bars of 2-1/2 inches for No. 5 and smaller and 6 bar diameters for bars larger than No. 5.
- C. Lap splices shall be contact lap splices in accordance with ACI 318 unless noted otherwise on the Contract Drawings. Bars shall be wired together at laps. Wherever possible, stagger splices in adjacent bars. Make all splices in wire fabric at least 1-1/2 meshes wide or 12 inches, whichever is greater. When splicing in areas to receive shotcrete, lap splices shall be non-contact with at least 2 inches clearance between bars.
- D. Butt splices shall be accomplished by mechanical anchorage devices.

3.04 CLEANING REINFORCEMENT

- A. Take all means necessary to ensure that steel reinforcement, at the time concrete is placed around it, is completely free from rust, dirt, loose mill scale, oil, paint and all coatings which will destroy or reduce the bond between steel and concrete.

SECTION 032000 – REINFORCING STEEL

3.05 FIELD QUALITY CONTROL

- A. Inspection: The City's agent will perform the inspections shown on the contract drawings.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 APPLICABLE SECTION

- A. Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, and installing cast-in-place concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
 - 1. Design of Concrete Mixes.
 - 2. All concrete and cement finishing; all surface treatment and curing, including non-slip finishes and color work.
 - 3. Installation of all reglets, bolts, anchors, cans, sleeves, column anchor bolts, etc., whether furnished under this section or by others (except cans and sleeves required under the Electrical and Mechanical Divisions).
 - 4. The furnishing of all items required to be or shown on the drawings as embedded in concrete, which are not specifically required under other sections.
 - 5. Setting headers and screeds. Curing and protecting concrete.
 - 6. Grouting of column bases.
 - 7. Routing out cracks and saw cutting control joints as required by waterproofing.
 - 8. Grouting between bearing plates, channels, etc. and bearing surfaces.
 - 9. Drilling of existing concrete and masonry for placement of bars, dowels, and rods.
 - 10. Grouting of bars, dowels, and rods in existing concrete and existing masonry.
- C. Related Work Specified Elsewhere:
 - 1. Section 031000, CONCRETE FORMWORK.
 - 2. Section 032000, REINFORCING STEEL.

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3. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.
4. Section 055100, METAL STAIRS.
5. Inserts, sleeves, cans etc. required under Division 22, PLUMBING, Division 23, HVAC, and Division 26, ELECTRICAL.

1.03 REFERENCE STANDARDS

- A. The following is a list of Reference Standards referred to in this portion of the Specification:
1. ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 2. ASTM C33, Standard Specification for Concrete Aggregates.
 3. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 4. ASTM C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 5. ASTM C94, Standard Specification for Ready Mixed Concrete.
 6. ASTM C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.
 7. ASTM C150, Standard Specification for Portland Cement.
 8. ASTM C157, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
 9. ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
 10. ASTM C172, Standard Practice for Sampling Freshly Mixed Concrete.
 11. ASTM C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 12. ASTM C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 13. ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 14. ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 15. ASTM C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
 16. ASTM C494, Standard Specification for Chemical Admixtures for Concrete.
 17. ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 18. ASTM C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

SECTION 033000 – CAST-IN-PLACE CONCRETE

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
1. ASTM C94, Specifications for Ready Mixed Concrete.
 2. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
 3. ACI 121R, Quality Management System for Concrete Construction.
 4. ACI 201.2R, Guide to Durable Concrete.
 5. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
 6. ACI 214R, Recommended Practice for Evaluation of Strength Test Results in Concrete.
 7. ACI 301, Specifications for Structural Concrete.
 8. ACI 302.1R, Guide for Concrete Floor and Slab Construction.
 9. ACI 304.2R, Placing Concrete by Pumping Methods.
 10. ACI 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 11. ACI 305R, Guide to Hot Weather Concreting.
 12. ACI 306.1, Standard Specification for Cold Weather Concreting.
 13. ACI 308R, Guide to Curing Concrete.
 14. ACI 309R, Guide for Consolidation of Concrete.
 15. ACI 311.4R, Guide for Concrete Inspection.
 16. ACI 318, Building Code Requirements for Structural Concrete.
 17. ACI SP-15, Field Reference Manual: Standard Specifications for Structural Concrete with Selected ACI and ASTM References.
 18. ACI SP-2, ACI Manual of Concrete Inspection.
 19. ACI SP-66, ACI Detailing Manual.
 20. California Building Code, current edition.
- B. Certificates of Compliance: The Contractor shall provide Certificates of Compliance for concrete materials in accordance with the requirements of Section 1.05, Submittal, of these specifications. When Certificates of Compliance cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Section 1.05, Submittal, of these specifications.
- C. Engineer's Review: The Engineer will review the mix designs prepared by the testing laboratory hired by the Contractor.
- D. Sampling, Testing and Inspection:
1. General:
 - a. All materials and work shall be subject to inspection at the batch plant, and at the building site. Material or workmanship not

SECTION 033000 – CAST-IN-PLACE CONCRETE

complying fully with the drawings, and/or specifications will be rejected.

- b. If the City's agent, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
2. City: The City shall employ an independent testing laboratory as the City's agent to perform the sampling, testing, and inspections shown on the contract drawings, and submit certified test results.
 3. Contractor:
 - a. The Contractor shall cooperate with and notify City's agent at least 24 hours in advance of inspection required and shall provide samples and facilities for inspection without extra charge.
 - b. The Contractor shall hire a professional testing laboratory to provide concrete mix designs for each type of concrete on the job. Each mix design shall be verified by trial batch tests or laboratory test reports and certified to by a principal of the laboratory who is a registered Civil Engineer in the State of California and submitted to the Architect for review. Laboratory test reports, in order to be acceptable, must indicate that not less than 90 percent of at least 20 consecutive 28-day tests exceed the specified strength, and none of said tests are less than 95 percent of specified strength.

1.05 SUBMITTALS

- A. General Requirements:
 1. Submittals shall be made to Architect in accordance with the requirements of Division 01, GENERAL REQUIREMENTS, of these specifications.
 2. Construction and fabrications or mixing of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.
- B. Mix Designs:
 1. Mix designs shall be submitted for each class of concrete on the job and shall show names and brands of all materials, proportions, slump, strength, gradation of coarse and fine aggregates, and location to be used on job.
 2. Mix designs for concrete designated by compressive strength shall be proportioned on the basis of field experience or trial mixtures, as described in ACI 301.
 3. Drying shrinkage data should be provided in the test histories or trial mixtures for suspended slabs and slabs on grade.
- C. Concrete Placement Schedule: The Contractor shall submit a concrete placement schedule which shall show all proposed construction joint locations, limits of each placement sequence, order of placement and type of joint proposed at each joint location.

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- D. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following materials:
1. Epoxies.
 2. Grout.
 3. Admixtures.
 4. Curing Compounds.
 5. Chemical Hardener.
 6. Moisture Barriers.
 7. Waterstops.
- E. Samples: Submit samples of materials as specified and as otherwise required by Architect, including names, sources and descriptions.
- F. Certificates of Compliance:
1. The Contractor shall provide Certificate of Compliance for each type of aggregate, cement and admixture to be used in each class of concrete or a Certificate of Compliance for each class of concrete.
 2. Certificates of Compliance shall include the name, source, and description of all materials used in each class of concrete and shall be signed by the concrete supplier certifying that each material item complies with or exceeds the specified requirements. Certificates of Compliance shall be furnished 60 days in advance of any concrete pours.
 3. When Certificates of Compliance cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance of each type of material to be used in each Class of Concrete. The cost of testing shall be paid for by the Contractor.
- G. Laboratory Test Reports:
1. Laboratory test reports shall show the name of testing agency, date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California. Laboratory tests shall not be older than 8 months and shall certify that the tested materials meet the specified standards.
 2. Laboratory test reports for concrete mix designs shall clearly identify each material or mix number of each mix tested to verify the correlation between the tested mix designs and the proposed mix designs.
 3. When required by other portions of these specifications, laboratory test reports shall be submitted for each material to be used in each class of concrete, or for each mix design and shall show compliance with appropriate ASTM Standards and these specifications.
- H. Weight and Batch Tags:
1. Weight and batch tags will be supplied to the engineer upon request.

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1.06 SEQUENCING AND SCHEDULING

- A. Obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete so provision for their work can be made without delaying the project.
- B. Do any cutting and patching made necessary by failure or delay in complying with these requirements, at no cost to City.

PART 2 - PRODUCTS

2.01 CEMENTITIOUS MATERIALS

- A. Portland Cement
 - 1. Portland cement shall conform to ASTM C150 for Type II cement. Use a single, approved standard brand throughout work.
- B. Fly Ash
 - 1. Fly ash shall conform to ASTM C618 for Class F fly ash.
- C. Ground Granulated Blast Furnace Slag
 - 1. Slag shall conform to ASTM C989, Grade 100 or 120.

2.02 CONCRETE AGGREGATES

- A. Aggregates for hardrock concrete shall conform to ASTM C33.
- B. Aggregates for light-weight concrete shall conform to ASTM C330.
- C. Fine Aggregate: Use washed natural sand of hard, strong particles and not more than 1 percent of deleterious materials. Not more than 2.5 percent shall pass the No. 200 sieve. Fineness modulus – 2.65 to 3.05.
- D. Coarse Aggregate: Use clean, sound-washed gravel or crushed rock. Not more than 1 percent deleterious material or 5 percent flat, thin, elongated or laminated material allowed. Cleanness value shall not be less than 75 when tested in accordance with California Test 227.

2.03 WATER

- A. Mixing Water for concrete shall be clean and free from deleterious amounts of acids, alkalis or organic materials.

SECTION 033000 – CAST-IN-PLACE CONCRETE

2.04 NONSHRINK GROUT

- A. Nonshrink grout shall be pre-mixed, high strength, flowable grout which does not shrink as it cures. Nonshrink grout shall attain a minimum compressive strength of 5000 psi at 7 days. Subject to compliance with requirements provide one of the following:
1. Metallic:
 - a. Embeco 636; BASF.
 - b. Sikagrout 212; Sika Chemical Company.
 - c. Burke Metallic Spec Grout; Dayton Superior Corporation.
 2. Non-Metallic:
 - a. Masterflow 928; BASF.
 - b. SonogROUT 10K; BASF.
 - c. Sure-Grip Grout; Dayton Superior Corporation.

2.05 CURING PRODUCTS

- A. Liquid membrane curing compounds: Liquid membrane curing compounds shall conform to the requirements of ASTM C309.
- B. Waterproofing Paper: Waterproofing paper for curing concrete shall conform to the requirements of ASTM C171.

2.06 AIR-ENTRAINING ADMIXTURE

- A. Air-entraining admixtures shall conform to the requirements of ASTM C260. Subject to that compliance, provide one of the following:
1. Sika Aer; Sika Corporation.
 2. MB-VR or MB-AE; BASF.
 3. Dorex AEA; W.R. Grace.

2.07 WATER-REDUCING ADMIXTURE

- A. Water-reducing admixtures shall conform to the requirements of ASTM C494, Type A, and contain no more than 0.1 percent chloride ions. Subject to compliance with requirements, provide one of the following:
1. Eucon WR-75; Euclid Chemical Company.
 2. MasterPozzolith 322; BASF.
 3. Plastocrete 160; Sika Chemical Corporation.

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2.08 HIGH-RANGE WATER-REDUCING ADMIXTURE (SUPER PLASTICIZER)

- A. Super Plasticizer shall conform to the requirements of ASTM C494, Type F or Type G and contain no more than 0.1 percent chloride ions. Subject to compliance with requirements, provide one of the following:
 1. ADVA 190; W.R. Grace.
 2. Sikament; Sika Chemical Corporation.
 3. Pozzolith 400; BASF.

2.09 WATER-REDUCING, RETARDING ADMIXTURE

- A. Water-reducing, retarding admixtures shall conform to the requirements of ASTM C494, Type D, and contain no more than 0.1 percent chloride ions. Subject to compliance with requirements, provide one of the following:
 1. Pozzolith 300-R; BASF.
 2. Daratard; W.R. Grace.
 3. Plastiment; Sika Chemical Corporation.

2.10 WATERSTOPS

- A. General: Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as indicated. Size to suit joints.
- B. Rubber Waterstops: Rubber Waterstops shall conform to the requirements of Corps of Engineers CRD-C513. Subject to compliance with requirements, provide one of the following:
 1. Dayton Superior Corporation.
 2. Progress Unlimited.
 3. Williams Products.

2.11 CONCRETE

- A. Concrete Mix Requirements: See plans for concrete mix design requirements and specifications.
- B. Lightweight Concrete Mix Requirements: Lightweight concrete shall have a maximum air-dried weight of 115#/ft³, a minimum 28-day compressive strength, minimum cement concrete, and maximum water/cement ratio as listed in the contract documents.
- C. Slumps noted on the plans are for concrete without admixtures to be consolidated using vibration. Formwork constraints, congestion of rebar, and pumping of concrete may require increased slump beyond the slump listed on the plans. The contractor shall adjust the slump up to 8 inches maximum using admixtures as necessary to provide workability and consistency to permit

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concrete to be worked readily into forms and around reinforcement under conditions of placement to be employed without segregation or excessive bleeding. All admixtures shall be noted in the submitted mix design and are subject to the Engineer's review. Slump shall not exceed 3 inches for any concrete placement where top of surface slopes more than 2 percent.

- D. At Contractor's option, an air entraining agent conforming to the latest revision of ASTM Specification C260 may be added to the concrete to provide entrained air. Air-entraining shall not exceed 3 percent \pm 1.5 percent without the approval of the engineer.
- E. Drying Shrinkage: The average "Drying Shrinkage" of the concrete after 21 days of drying shall not exceed 0.040 in suspended slabs and 0.048 percent for slabs on grade.

2.12 CONTROL JOINTS

- A. Control joints shall be sawcut using SOFF-CUT International or equal.

2.13 UNDERSLAB VAPOR BARRIER/RETARDER

- A. Vapor barrier/retarder membrane including installation accessories, for installation under concrete slabs-on-grade for floors of interior spaces as follows:
 1. Minimum 15-mil-thick polyolefin geomembrane for superior barrier performance and for tear strength and puncture resistance, manufactured from ISO certified virgin resins.
 2. Acceptable Manufacturers:
 3. Stego Wrap (15-mil) Vapor Barrier as manufactured by Stego Industries LLC, San Juan Capistrano, CA, Phone: 949-493-5460, Website: www.stegoindustries.com.
 4. Ecosheild-E15 (15-mil) Vapor Barrier as manufactured by Epro, Derby, KS.
 5. Griffolyn Vaporguard as manufactured by Reef Industries, Houston, TX.
 6. Physical Properties:
 7. Tensile Strength: ASTM E-175, minimum 45.0-lbf/in.
 8. Water Vapor Barrier: ASTM E-1745, meets or exceeds Class B.
 9. Water transmission Rate: ASTM E-96, 0.006-gr/ft²/hr or lower.
 10. Permeance Rating: ASTM E-96, 0.01-gr/ft²/hr or lower.
 11. Puncture Resistance: ASTM E-1745, minimum 1970 grams.
 12. Installation Accessories:
 13. Seam Tape and Vapor Proofing Mastic: Water Vapor Transmission Rate shall be 0.3-perms or lower per ASTM E96.
 14. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

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15. Vapor Stakes: Provide Density of 0.0289-lb/in³ per ASTM D1505: and Specific Gravity of 0.0477 per ASTM D792.
- B. Vapor barrier/retarder membrane shall be installed in accordance with manufacturer's printed instructions and ASTM E1643-04. The following shall serve as a general outline for preparation and installation:
1. Preparation: Ensure that subsoil is approved by architect or geotechnical firm. Level and tamp or roll aggregate, sand or tamped earth base as applicable.
 2. Schedule preconstruction meeting/conference at the site with field representative of the vapor barrier/retarder membrane prior to installation. Provide minimum one week notice to manufacturer's representative and the Architect.
 3. Unroll vapor barrier/retarder with the longest dimension parallel with the direction of the pour. Lap vapor barrier/retarder over footings and seal to foundation walls. Seal to interior/perimeter footings using specified mastic. Overlap joints 6 inches and seal with manufacturer's seam tape.
 4. Seal all penetrations (including pipes) per manufacturer's instructions, and as follows:
 - a. Seal single pipe penetrations using pipe boot constructed from the product:
 - 1) Cut a piece of vapor barrier membrane; minimum 12 inches wide and length of 1-1/2 times the circumference of the pipe.
 - 2) Cut slits half the width of the film using scissors.
 - 3) Wrap boot around pipe; tape onto pipe and completely tape the base to the vapor barrier/retarder membrane.
 5. Multiple pipe penetrations in close proximity and very small pipes may be sealed using specified vapor proofing mastic.
 - a. Cut out a small area around pipes.
 - b. Cut a patch of vapor barrier/retarder membrane extending at least 6 inches past the cut-out portion in all directions.
 - c. Cut X's or small circles in the patch and install over pipes.
 - d. Overlap at least 6 inches and tape.
 - e. Buildup 40-60 mils of mastic, or as needed to completely fill all voids between the pipe and the vapor barrier/retarder membrane.
 6. No penetration of the vapor barrier/retarder membrane is allowed except for reinforcing steel and permanent utilities.
 7. In the case that forms must be used vapor stakes should be used to hold forms in place:
 - a. Penetrate plastic with stake.
 - b. Treat stake as pipe penetrations (see paragraphs 3.a. - 3.e, above).
 - c. Leave stakes permanently in concrete.
 - d. Using a power saw, cut the stake off above the seal, but below the surface of the finished concrete.
 - e. The lower portion of the vapor stake remains in place, permanently plugging the penetration.

SECTION 033000 – CAST-IN-PLACE CONCRETE

8. Repair damaged areas by cutting patches of vapor barrier/retarder membrane, overlapping damaged area 6 inches and taping all four sides with tape.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Produce concrete of required consistency and strength to present appearance satisfactory to Architect.
- B. Use only one brand of cement unless otherwise authorized by Architect.
- C. Embedded Items: Place all pipe sleeves, inserts, anchors bolts, angle frames, ties and other embedded items required for adjoining work or for its support prior to concreting. Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts and anchor bolt slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.
- D. Store materials delivered to the job and protect from foreign matter and exposure to any elements which would reduce the properties of the material.
- E. When concrete is cast against existing concrete the surface shall be cleaned and roughened by sandblasting, grinding, bush hammering or other suitable means. Wet the surface until it is damp, but without visible free water.

3.02 EXISTING CONCRETE SURFACE PREPARATION

- A. Where concrete is to be cast against existing concrete, prepare the surface of existing concrete as follows, unless noted otherwise:
 1. Chip or scarify surface as required to remove all spalled, severely cracked, deteriorated, loose or unsound material.
 2. Chip or scarify any area as required to remove offsets which would cause an abrupt change in thickness of the new concrete. Taper edges to leave no square shoulders at the perimeter of a cavity.
 3. Sand-blast or water-blast all surfaces to receive new concrete to remove all dirt, paint, grease, fractured concrete, oil, or other substances that could interfere with the bond of the newly placed concrete. Clean forms and reinforcing of drippings. Clear away debris by compressed air.
 4. Wet the surface until it is damp, but without visible free water.
- B. Where noted on the drawings to 'intentionally roughen' surface, prepare the surface of existing concrete as follows:

SECTION 033000 – CAST-IN-PLACE CONCRETE

1. Chip or scarify surface as required to remove all spalled, severely cracked, deteriorated, loose or unsound material.
2. Chip or scarify any area as required to remove offsets which would cause an abrupt change in thickness of the new concrete. Taper edges to leave no square shoulders at the perimeter of a cavity.
3. Sand-blast using coarse sand or water-blast to clean and roughen to 1/4-inch amplitude all surfaces to receive new concrete, exposing coarse aggregate solidly embedded in mortar matrix. Clean forms and reinforcing of drippings. Clear away debris by compressed air.
4. Wet the surface until it is damp, but without visible free water.

3.03 MIXING

- A. Use ready-mixing concrete complying with ASTM C94 and with the requirements of Contract Documents. Mix for a period of not less than 10 minutes; at least 3 minutes of mixing period shall be immediately prior to discharging at the job.
- B. Introduction of additional water after initial mixing not permitted.

3.04 WEATHER REQUIREMENTS

- A. Do not mix or place when atmospheric temperature is below 40 deg F or when conditions indicate temperature will fall below 40 degrees within 72 hours. Reinforcement, forms, and ground which concrete will contact shall be completely free of frost. Keep concrete and formwork at a temperature not less than 50 deg F for not less than 72 hours after pouring.
- B. When temperature is above 80 deg F Contractor shall take precautions to insure that rebar temperature does not exceed ambient temperature.
- C. Temperature of concrete at time of placing shall not be less than 50 deg F and not more than 85 deg F.

3.05 CONVEYING AND PLACING

- A. All concrete shall be mixed and delivered in accordance with the requirements of ASTM C94. All concrete shall be placed, finished and cured and all other pertinent construction practices shall be in accordance with the requirements of ACI 301.
- B. It is the contractor's responsibility to provide a concrete mix suitable for the job site conditions. Workability and pumpability may be increased by methods noted in Section 2.11 of this Specification.

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- C. Notify Architect at least 48 hours before placing any concrete.
- D. Before placing, clean mixing and conveying equipment, clean forms and space to be occupied by concrete and wet forms. Remove ground water until completion of work.
- E. Place no concrete in any unit of work until all formwork has been completely constructed, all reinforcements secured in place, all items to be built into concrete are in place, and form ties at construction joints tightened.
- F. Concrete shall be placed so that a uniform appearance of surfaces will be obtained. The concrete will be free of all rock pockets, honeycombs and voids. Deposit as nearly as practical in its final position.
- G. The subgrade must be moist when the concrete is placed for floor slab to prevent excessive loss of water from the concrete mix.
- H. Carry on concreting, once started, as a continuous operation until the section of approved size and shape is completed. Make pour cut-offs of approved detail and location.
- I. Handle concrete as rapidly as practicable from mixer to place of deposit by methods which prevent separation or loss of ingredients. Deposit as nearly as practicable in final position to avoid rehandling or flowing. Do not drop concrete freely where reinforcing bars will cause segregation, nor drop freely more than 4 feet. Deposit to maintain a plastic surface approximately horizontal. In walls, deposit in horizontal layers not over 18 inches deep. In pouring columns, walls or thin sections of considerable heights, use openings in forms, elephant trunks, tremies or other approved devices which permit concrete to be placed without segregation or accumulation of hardened concrete on forms or metal reinforcement above the level of the concrete. Install so concrete will be dropped vertically.
- J. Concrete that has partially hardened shall not be deposited in the work.
- K. All concrete floors except sloping to drains shall be brought to a level not exceeding 1/8-inch in 10 feet measured with a straight edge.
- L. Vibrating: Employ as many vibrators and tampers as necessary to secure the desired results. Minimum: one per each 20 cubic yards of concrete placed per hour. Eliminate the following practices: Pushing of concrete with vibrator; external vibration of forms; allowing vibrator to vibrate against reinforcing steel where steel projects into green concrete; allowing vibrator to vibrate contact faces of forms. Vibrators shall function at a minimum frequency of 3,600 cycles per minute when submerged in concrete. Supplement vibration by forking and spading along the surfaces of the forms and between reinforcing whenever flow is restricted.

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- M. Tremie Concrete: Tremie concrete is a special procedure for placing concrete underwater. Tremie concrete shall be placed by pump or a gravity feed pipe. If a gravity feed pipe is used it shall be 8 inches minimum diameter and shall be affixed with a shutoff device at the bottom that will allow filling of the pipe with concrete without allowing water to enter. The trunk of the pump or gravity pipe shall be placed at the bottom of caisson prior to placing any concrete. The pump trunk or gravity pipe shall be removed slowly as the caisson is filled insuring that the end of pump trunk or gravity pipe is embedded in concrete a minimum of 1 foot.

3.06 CURING

- A. General: Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained with minimum moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
- B. Initial Curing:
1. Initial curing shall immediately follow the finishing operation. Concrete shall be kept continuously moist at least overnight. One of the following material or methods shall be used: Ponding or continuous sprinkling; absorptive mat or fabric kept continuously wet.
 2. Curing compounds conforming to ASTM C309. Such compounds shall be applied in accordance with the recommendations of the manufacturer and shall not be used on any surface against which additional concrete or other cementitious finishing materials are to be bonded, where epoxy flooring is called for, where concrete topping is to receive waterproofing membrane, or on surfaces where such curing is prohibited by the project specifications.
- C. Final Curing:
1. Immediately following the initial curing and before the concrete has dried, additional curing shall be accomplished by one of the following materials or methods:
 - a. Continuing the method used in initial curing.
 - b. Waterproofing paper conforming to the requirements of ASTM C171.
 - c. Other moisture-retaining coverings as approved.
- D. Duration of Curing: The final curing shall continue until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50 deg F has totaled seven days. If high-early-strength concrete has been used, the final curing shall continue for a total of three days. Rapid drying at the end of the curing period shall be prevented.

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- E. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period shall be kept wet. If forms are to be removed during the final curing period, one of the above curing materials or methods shall be employed immediately. Such curing shall be continued for the remainder to the curing period.
- F. Architecturally Exposed Slabs: Architecturally exposed slabs shall be cured by moisture-retaining cover curing. Thoroughly wet the surface of the concrete and then cover with moisture-retaining cover, placed in widest practical width, with edges lapped at least 12 inches and extended 18 inches beyond the area of concrete to be cured, and seal with waterproofing tape. Maintain a film of water under the cover through the curing period by rolling back and rewetting. Immediately repair any holes or tears that occur using cover material and waterproof tape. Start moisture-retaining cover curing as soon as free water has disappeared from concrete surface following finishing. Curing shall be maintained for 7 days.

3.07 CONCRETE FINISHES

- A. Finishes:

<u>Element</u>	<u>Finish</u>
Exposed foundation surfaces	Rough troweled finish
Permanently exposed formed surfaces	Grout cleaned and sacked
Slabs	Smooth troweled finish

- B. Grout Cleaned Finish: After the concrete still freshly hardened has been pre-dampened, a slurry consisting of one part cement and one and one-half parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Any surplus shall be removed by scraping and then rubbing with clean burlap. The finish shall be cured in an approved manner. Sample to be approved by Architect.
- C. Troweled Finish: Where a troweled finish is specified, the surface shall be finished first with power floats, then with power trowels, and finally with hand trowels. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Additional trowelings shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be free of any trowel marks, uniform in texture and appearance.
- D. Broom or Belt Finish: Slabs shall be given a coarse traverse scored texture by drawing a broom or burlap belt across the surface. Slabs with less than 6 percent slope shall receive a medium broom finish. Slabs with greater than

SECTION 033000 – CAST-IN-PLACE CONCRETE

6 percent slope shall receive a heavy broom finish. This operation shall follow immediately after troweling.

3.08 PROTECTION

- A. Protect from injurious action of elements and defacement of any nature during operations.

3.09 CONSTRUCTION JOINTS

- A. Location and details of construction joints shall be as indicated on drawings, specified, or as approved by the Architect. Locate so as not to impair the strength of the structure. Submit drawings with construction joints clearly defined, and schedule of pouring operations for approval in accordance with Section 1.05, Submittals, of this Specification, prior to starting concreting.
- B. Sandblast all construction joints using coarse sand or waterblast to clean and roughen entire surface of joint, exposing coarse aggregate solidly embedded in mortar matrix. Clean forms and reinforcing of drippings. Clear away debris by compressed air.

3.10 CONTROL JOINTS

- A. Provide as indicated on the drawings.

3.11 PATCHING AND CLEANING

- A. After forms are removed, remove projecting fins, bottles, form ties, nails, etc. not necessary for the work or cut back 1-inch from the surface. Joint marks and fins in exposed work shall be smoothed off and cleaned as directed by the Architect.
- B. Repair defects in concrete work as directed by the Engineer. Chip voids and stone pockets to a depth of 1-inch or more as required to remove all loose material. Voids, surface irregularities, chipped areas, etc., shall be filled by patching, gunite or rubbing, as directed by the Architect. Repaired surfaces shall duplicate appearance of unpatched work.
- C. Clean exposed concrete surfaces and adjoining work stained by leakage of concrete to approval of Architect.

SECTION 033000 – CAST-IN-PLACE CONCRETE

3.12 CLEANUP

- A. In addition to the requirements of Supplementary General Conditions, clean up all concrete and cement work on completion of this portion of the work, except protective coatings or building papers shall remain until floors have completely cured or until interior partitions are to be installed.

3.13 GROUTING

- A. Column base plates: The grout shall be mixed and placed in strict accordance with manufacturer's instructions. Care shall be taken in the grouting to ensure that there are no voids or air pockets, and that there is full bearing between the base plates and the grout.
- B. Bearing plates and channels: The space between plates and channels bearing against masonry or concrete shall be filled with grout when required by the Engineer. The grout shall be mixed and placed in strict accordance with manufacturer's instructions. Care shall be taken in the grouting to ensure that there are no voids or air pockets, and that there is full bearing between the bearing plates and channels and the grout.

3.14 DEFECTIVE WORK

- A. General: Work considered to be defective may be ordered by the Architect to be replaced, in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to, the following:
 - 1. Concrete in which defective or inadequate reinforcing steel has been placed.
 - 2. Concrete in incorrectly formed, or not conforming to details and dimensions on the drawings or with the intent of these documents or concrete the surfaces of which are out of plumb or level.
 - 3. Concrete below specified strength.
 - 4. Concrete not meeting the maximum allowable drying shrinkage requirements.
 - 5. Concrete containing wood, cloth, or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.15 CORRECTION OF DEFECTIVE WORK

- A. The Contractor shall, at his expense, make all such corrections and alleviation measures as directed by the Architect.

SECTION 033000 – CAST-IN-PLACE CONCRETE

- B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings, shall be chipped out until all unconsolidated material is removed.
- C. Secure approval of chipped-out areas before patching. Patch per ACI 301, or as ordered by the Architect.

3.16 FIELD QUALITY CONTROL

- A. Inspections: The City's agent will perform inspections shown on the contract drawings.
- B. Engineer Review: The Engineer shall inspect the surfaces between plates and channels, bearing on masonry and concrete to determine if grouting of space is necessary. If grouting of space is necessary, the City's agent shall inspect the grouting procedure.
- C. Sampling and Testing: The City's agent will perform sampling and testing shown on the contract drawings.
- D. Test Results: Test results shall be reported in writing to Engineer and Contractor within 7 days after tests are made. Test results of less than 60 percent fc at 7 days and less than 100 percent fc at 28 days shall be reported in writing to the Engineer and Contractor within 48 hours after tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing services, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests. Strength level of concrete will be considered satisfactory if the averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below the specified compressive strength by more than 500 psi. Concrete batch plant weight tags shall be collected at the site and submitted to the Engineer.
- E. When the strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.

SECTION 033000 – CAST-IN-PLACE CONCRETE

- F. Additional Tests: The City's agent will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. City's agent may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, other additional testing as may be required, and cost of repairing areas of structure tested when unacceptable concrete is verified.

END OF SECTION

SECTION 033330

CONCRETE FLOOR HARDENER/SEALER

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Sealer for interior exposed concrete floor slabs scheduled as “SC” on the Drawings.
 - 2. Surface preparation for concrete.
- C. Related Sections:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE, for concrete finishing and curing materials and procedures.
 - 2. Section 033550, POLISHED CONCRETE FLOOR FINISHING, for concrete grinding, dyeing, and polishing materials and procedures.
 - 3. Section 079200, JOINT SEALANTS, for sealing non-traffic and traffic joints in locations not specified in this Section.
 - 4. Section 096513, RESILIENT BASE AND ACCESSORIES, for base material to be installed at rooms with concrete floor sealer.

1.02 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data:
 - 1. Submit manufacturer's product specifications and installation instructions for type of product specified.
 - 2. Submit certification by sealer manufacturer that products comply with local regulations controlling use of VOC's.
- C. Sample Mockup:
 - 1. Provide 9-square-foot mock-up slab.
 - 2. Apply mock-up for application of floor finish system specified by this Section.

SECTION 033330 – CONCRETE FLOOR HARDENER/SEALER

3. Maintain approved mock-up as standard for work of this Section.
4. Locate where designated by Engineer. Approved mock-ups may remain as part of finished work.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Engage an Installer with minimum 5 years' experience who has completed special concrete sealers similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Regulatory Requirements:
 1. Comply with provisions of air-pollution VOC regulations of authorities having jurisdiction.
- C. Compatibility:
 1. Before applying sealer, confirm that there will not be compatibility problems between the sealer and other concrete curing materials.
 2. This product provides both curing and sealing of the concrete.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers with labels indicating manufacturer, product name and designation, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.

SECTION 033330 – CONCRETE FLOOR HARDENER/SEALER

- B. Concrete Densifier:
 - 1. SIL-CRETE™ Lithium-Silicate Curing Agent and Densifier.
 - a. Water-borne, low solids, lithium-silicate-based curing agent and densifier formulation as manufactured by W.R. Meadows, Inc., Phone (800) 342-5976; or approved equal.
- C. Concrete Sealer:
 - 1. VOCOMP-20, water-based acrylic sealing compound as manufactured by W. R. Meadows, Inc., Phone: (800) 342-5976; or approved equal.

2.02 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Static Coefficient of Friction: Provide walking surfaces with the following values as determined by testing per ASTM C1028:
 - 1. Minimum 0.60 (wet) at slopes less than 6 percent.
 - 2. Minimum 0.80 (wet) at slopes greater than 6 percent.

PART 3 - EXECUTION

3.01 INSTALLATION – GENERAL

- A. General: Comply with manufacturer's installation/application instructions. The following shall serve only as a brief outline of the installation procedures.
- B. Apply to curing compound/densifier to new concrete when surface water has disappeared, and surface finishing operations are complete and concrete surface will not be marred by walking workmen.
- C. Apply sealing compound in accordance with manufacturer's instructions.
 - 1. Ensure product is mixed for optimum performance. Avoid aggressive mixing as foaming may occur.
 - 2. Apply two coats in a sequence per manufacturers recommendation.
 - 3. Use an industrial sprayer with a 5916 tip that produces a flow rate of 1/10 of one gallon per minute under 0.276 MPa (40 psi) of pressure.
 - 4. Spray on in a fine, fog pattern, without spurts and dribbles, to form a thin, continuous film.
 - 5. Alternatively apply using a lint-free roller or lamb's wool roller.
 - 6. Avoid puddling in low areas.

SECTION 033330 – CONCRETE FLOOR HARDENER/SEALER

- D. Schedule of Areas to Receive Concrete Sealant:
1. Areas indicated on the Drawings as “SC” or “Sealed Concrete,” provide two coats.

END OF SECTION

SECTION 033550

POLISHED CONCRETE FLOOR FINISHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: this section specifies polished concrete.
- B. Related Sections:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE, for coordination with concrete mix design, curing compounds and densifiers to ensure compatibility with polishing systems.
 - 2. Section 079200, JOINT SEALANTS, for sealants in concrete floor surfaces.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 302.1R, Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM C309, Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete. Section 093000, CERAMIC TILE. Set metal base beads requiring installation prior to wall surface.
 - 2. ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
 - 3. ASTM C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
 - 4. ASTM C805, Standard Test Method for Rebound Number of Hardened Concrete.
 - 5. ASTM E1155, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

1.03 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide polished flooring that has been selected, manufactured, and installed to achieve the following:
 - 1. Abrasion Resistance: ASTM C779; up to 400 percent increase in abrasion resistance.
 - 2. Reflectivity: Increase of 35 percent as determined by gloss meter.
 - 3. Impact Strength: ASTM C805; up to 21 percent increased impact strength.

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING

4. Must meet or exceed ADA/OSHA suggested 0.5 standard value for the Static Co-efficient of Friction.
 5. Static Coefficient of Friction and Dynamic Coefficient of Friction: B101.1-2009 and B101.3-2012 NFSI Certified with Phase 1 and Phase 2 testing.
- B. Design Requirements:
1. Hardened Concrete Properties:
 - a. Minimum Concrete Compressive Strength: 3500 psi.
 - b. Normal Weight Concrete; no lightweight aggregates.
 - c. Non-Air-Entrained Concrete.
 2. Placement Properties for New Concrete:
 - a. Natural concrete slump of 4-1/2-inch to 5-inch; admixtures may be used.
 - b. Flatness Requirements:
 - 1) Overall Ff 50.
 - 2) Local Ff 35.
 - 3) Flatness testing cost and scheduling is responsibility of General Contractor.
 3. Hard-Steel Troweled (three passes) Concrete:
 - a. No burn marks; Finish to ACI 302.1R; Class 5 floor.
 4. Curing Options:
 - a. Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin); acrylic curing and sealing compounds not recommended.
 - b. Sheet membrane (ASTM C171) polyethylene film not recommended.
 - c. Damp curing: 7-day cure.
 - d. Penetrating cure – Ashford formula.

1.04 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at project site.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 1. Product Data for Credit IEQ 4.2 for liquid applied flooring components, documentation including printed statement of VOC content.

1.06 INFORMATIONAL SUBMITTALS

- A. Test Reports: Certified test reports, from an Independent Testing Laboratory, showing compliance with specified performance criteria and physical properties as cited in "Performance Requirements".

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING

- B. Certificates:
 - 1. Product and installer certificates signed by the manufacturer certifying materials meet specified performance characteristics and criteria and physical requirements.
 - 2. Current installation contractor's certificate signed by manufacturer declaring contractor as a certified installer of polishing system, prior to bidding of project.

1.07 CLOSEOUT SUBMITTALS

- A. Warranty: Submit warranty documents specified.
- B. Maintenance Data: For polished concrete finishing to include in maintenance manuals. Also include the following:
 - 1. Manufacturer's instructions on maintenance renewal of applied treatments.
 - 2. Protocols and product specifications for joint filling, crack repair and/or surface repair.

1.08 QUALITY ASSURANCE

- A. Manufacturers Qualifications:
 - 1. Manufacturer has a minimum of 5 years' experience in manufacturing components similar to or exceeding requirements of project.
 - 2. Manufacturer must be able to provide technically trained field representative during construction and approving application method
- B. Installer Qualifications:
 - 1. Installer experienced in performing work of this section who has specialized in installation work similar to that required for this project.
 - 2. Installer trained and having current certification for RetroPlate Concrete Polishing System.
- C. Mock-Ups:
 - 1. Mock-up size: 10-foot x10-foot floor area at job site, at location as directed under conditions similar to those which will exist during actual placement; divide mock-up area into four equal zones, allowing for sequential attempts to determine amount of aggregate exposure, and color (if required) and shine selection
 - 2. Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, color selection and shine level
 - 3. Allow 24 hours for inspection of mock-up before proceeding with work.
 - 4. When accepted, mock-up will demonstrate minimum standard of quality required for this project; once mock-up approved by the authorized individual(s), the General Contractor is responsible for protecting the approved mock-up for the duration of the project.

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING

- D. Required Aggregate Appearance Class:
 - 1. Class B – Fine Aggregate. Commonly called: Salt/Pepper Finish, 85 percent to 95 percent fine aggregate; 5 percent to 15 percent blend of fines and coarse aggregate.
- E. Polished Concrete Appearance Levels (Per ASCC Concrete Polishing Council)
 - 1. Apparatus Bay – Level 2, Satin. Matte Appearance, up to 200 to 400 grit polish; a DOI reading of 10 to 39; haze reading <10; reflective sheen: low to medium.
 - 2. All Others – Level 3, Polished. Images reflected and easily identified; not necessarily sharp and crisp; up to 400 to 800 grit polish; a DOI reading of 40 to 69; haze reading <10; reflective sheen, medium to high.
- F. Sequence With Other Work: Comply with manufacturer's written recommendations for sequencing construction operations; it is the General Contractor's responsibility to ensure that all other trades are aware of necessary sequencing and protection required prior to, during and after the installation of the polished concrete floor finish.]

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Ordering:
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery:
 - 1. Deliver materials in manufacturer's original packaging with identification labels and seals intact.
- C. Storage and Protection:
 - 1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 2. Protect concrete slab:
 - a. Protect from petroleum stains during construction.
 - b. Diaper all hydraulic lifts and power equipment.
 - c. Restrict vehicular parking; drop cloths will be placed under vehicles parked on slab.
 - d. No pipe cutting machinery will be used on interior floor slab.
 - e. Steel will not be placed on interior floor slab to avoid rust staining.
 - f. No acids or acidic detergents will come into contact with slab.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install work until ambient temperature and humidity conditions are maintained at levels indicated in reference standards.

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING

1.11 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. Manufacturer's Warranty: Submit for owner's acceptance, manufacturer's standard warranty document executed by authorized company official; manufacturer's warranty is in addition to and does not limit, other rights owner may have under contract documents.

PART 2 - PRODUCTS

2.01 PRODUCTS, GENERAL

- A. Ensure concrete finishing components and materials are from single source, from single manufacturer.

2.02 POLISHED CONCRETE FINISHING PRODUCTS

- A. Basis of Design Product:
 - 1. Curecrete Distribution, Inc. (dba Advanced Floor Products; RetroPlate System), 1203 Spring Creek Place, Springville, UT 84663, Phone: (801) 489-5663, Email: info@retroplatesystem.com.
 - 2. Or approved equal.
- B. Products/Systems:
 - 1. Hardener, Sealer, Densifier: RetroPlate 99 – penetrating, water-based, odorless liquid, VOC compliant, environmentally safe chemical.
 - 2. Concrete Grinding Accelerant, Concrete Clarity Enhancer: KickStart.
 - 3. Joint Filler: CreteFill Pro 85 – semi-rigid, two-component, self-leveling, 100 percent solids, rapid curing, polyurea control joint and crack filler.
 - 4. Stain Protector: RetroGuard.
 - 5. Cleaning Solution: CreteClean Plus / CreteClean Plus – Single Dose.
 - 6. Topically Applied, Transparent Concrete Dye: RetroPlate Concrete Dye Concentrate.
- C. Polished Concrete Dye Color: Ameripolish Midnight Black.

PART 3 - EXECUTION

3.01 MANUFACTURERS INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installations and Curecrete's Spec-Data sheets.

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING

3.02 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Verify that concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of finishing materials.
 - 2. Verify concrete is cured to 28 days or 3,500 psi strength.

3.03 PREPARATION

- A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.
- B. Examine surface to determine soundness of concrete for polishing.

3.04 INSTALLATION

- A. Floor Surface Polishing and Treatment:
 - 1. Provide densified and polished concrete floor treatment in entirety of slab as indicated by approved drawings; provide consistent finish in all contiguous areas.
 - 2. Perform work prior to installation of fixtures and accessories.
 - 3. Deliver a consistent finish in all contiguous areas utilizing KickStart to achieve the approved and designated Concrete Polishing Council's Aggregate Exposure and Polished Concrete Appearance designations as specified.
 - 4. Diamond-polish concrete floor surfaces utilizing KickStart in conjunction with proper grinding equipment as recommended by polishing system representative:
 - a. Comply with manufacturer's recommended polishing grits for each sequence using KickStart to achieve desired finish level; level of shine shall match that of approved mock-up.
 - b. Expose aggregate in concrete surface only as determined by approved mock-up.
 - c. All concrete surfaces shall be as uniform in appearance as possible.
 - 5. Apply RetroPlate 99 hardener, densifier as follows:
 - a. Apply RetroPlate 99 at 200 ft² per gallon, according to manufacturer's directions.
 - b. Apply RetroGuard according to manufacturer's directions.
 - 6. Remove defects and re-polish defective areas.
 - 7. Finish edges of floor and adjoining materials in a clean and sharp manner.

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING

3.05 FINAL CLEANING

- A. Mechanically scrub treated floors for seven days with soft to medium pads using approved cleaner CreteClean Plus / CreteClean Plus – Single Dose.
- B. Upon completion, general contractor must remove surplus and excess materials, rubbish, tools, and equipment.
- C. Leave one master case of CreteClean Plus Single Dose (12 oz) and instructions for initial cleanings.

3.06 PROTECTION

- A. Protect installed product (polished floors) from damage during construction.

END OF SECTION



LEVEL	NAME	DISTINCTNESS-OF-IMAGE (DOI) GLOSS	IMAGE CLARITY VALUE, %	HAZE INDEX
1	Flat (Ground)	Images of objects being reflected have a flat appearance.	0 – 9	<10
2	Satin (Honed)	Images of objects being reflected have a matte appearance.	10 – 39	
3	Polished	Images of objects being reflected do not have a sharp and crisp appearance but can be easily identified.	40 – 69	
4	Highly Polished	Images of objects being reflected have a sharp and crisp appearance as would be seen in a near-mirror like reflection. May require grouting.	70 – 100	



CLASS	NAME	SURFACE EXPOSURE, %
A	Cement Fines	85 – 95 % Cement Fines 5 – 15 % Fine Aggregate
B	Fine Aggregate	85 – 95 % Fine Aggregate 5 – 15 % Blend of Cement Fines and Coarse Aggregate
C	Coarse Aggregate	80 – 90 % Coarse Aggregate 10 – 20 % Blend of Cement Fines and Fine Aggregate

SECTION 033550 – POLISHED CONCRETE FLOOR FINISHING



CONCRETE POLISHING COUNCIL

POLISHED CONCRETE AGGREGATE EXPOSURE CHART

REPLACES CPAA AGGREGATE EXPOSURE CHART

CLASS	NAME	SURFACE EXPOSURE, %
A	Cement Fines	85 – 95 % Cement Fines 5 – 15 % Fine Aggregate
B	Fine Aggregate	85 – 95 % Fine Aggregate 5 – 15 % Blend of Cement Fines and Coarse Aggregate
C	Coarse Aggregate	80 – 90 % Coarse Aggregate 10 – 20 % Blend of Cement Fines and Fine Aggregate

Aggregate exposure class denotes the surface exposure after grinding and polishing operations. The density, size and distribution of the aggregates at the surface depends on the concrete mix design and placing and finishing operations. Floor flatness at the time of grinding and polishing operations is an important consideration in selecting the appropriate aggregate exposure class.

Surface exposure percentages are based on visual observation of the overall area of the polished floor.

Illustration of Differences in Class



Caution: This provides a visual representation of the differences in Class A, B and C. This may not represent the polished concrete in your area as it varies based on aggregate type, gradation, size and distribution. Consult with your CPC Polishing Contractor to see reference samples or mockups.

Contact your Concrete Polishing Council (CPC) contractor or the CPC Hotline at (844) 923-4678 or by email at cpchotline@asconline.org with any questions.

SECTION 037010

POST INSTALLED ANCHORS

PART 1 - GENERAL

1.01 APPLICABLE SECTIONS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this Section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing dowels in existing concrete, and masonry as described in this Section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work included:
 - 1. Installation of adhesive anchors in existing concrete and masonry.
 - 2. Installation of expansion anchors in existing concrete and masonry.
 - 3. Installation of threaded anchors in existing concrete and masonry.
- C. Related work specified elsewhere:
 - 1. Section 032000, REINFORCING STEEL
 - 2. Section 033000, CAST-IN-PLACE CONCRETE
 - 3. Section 042200, CONCRETE MASONRY UNIT

1.03 QUALITY ASSURANCE

- A. Codes and standards: comply with all federal, state and local codes and safety regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 318, "building code requirements of reinforced concrete," current edition.
 - 2. California building code, current edition.
- B. Testing and inspection: the City shall employ an independent testing laboratory or the engineer as the City's agent to perform the inspections and tests, shown

SECTION 037010 – POST INSTALLED ANCHORS

on the contract drawings and submit certified test results. The contractor will cooperate with and notify the City's agent at least 24 hours in advance of inspections required.

1.04 SUBMITTALS

- A. General requirements:
 - 1. Submittals shall be made to the architect in accordance with the requirements of Division 01, General Requirements, of these specifications.
 - 2. Construction and fabrication shall not begin until contractor has received submittals reviewed by architect governing all aspects of the intended work.

- B. Product data: manufacturer's catalog sheets including instruction for use and description of application shall be provided on each of the following materials:
 - 1. Adhesive Anchors – In addition to manufacturer's catalog sheets the contractor shall provide a written description of where each adhesive material will be used for each different application and an explanation of why the particular material was selected.
 - 2. Threaded Anchors – In addition to manufacturer's catalog sheets the contractor shall provide a written description of where each anchor will be used for each different application and an explanation of why the particular material was selected.
 - 3. Threaded Anchors – In addition to manufacturer's catalog sheets the contractor shall provide a written description of where each anchor will be used for each different application and an explanation of why the particular material was selected.

PART 2 - PRODUCTS

2.01 ADHESIVE ANCHORING SYSTEMS FOR CONCRETE

- A. Adhesive anchoring systems shall have current ICC or IAPMO reports for shear and tension in cracked concrete per the requirements of the California building code. Adhesive anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:
 - 1. HIT-RE 500 v3; Hilti [ICC ESR 3814].
 - 2. HIT HY 200; Hilti [ICC ESR 3187].
 - 3. SET-XP; Simpson Strong Tie [ICC ESR 2508].
 - 4. AT-XP; Simpson Strong Tie [IAPMO UES ER 263].
 - 5. PURE 110+; Dewalt\powers fasteners [ICC ESR 3298].
 - 6. AC100+ gold; Dewalt\powers fasteners [ICC ESR 2582].
 - 7. Approved equal.

SECTION 037010 – POST INSTALLED ANCHORS

2.02 ADHESIVE ANCHORING SYSTEMS FOR grouted CONCRETE block

- A. Adhesive anchoring systems shall have current ICC or IAPMO reports for shear and tension in grouted concrete block per the requirements of the California building code. Adhesive anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:
1. HIT HY 70; Hilti [ICC ESR 2682].
 2. SET-XP; Simpson Strong Tie [IAPMO UES ER 265].
 3. AT-XP; Simpson Strong Tie [IAPMO UES ER 281].
 4. AC100+ Gold, Dewalt\Powers fasteners [ICC ESR 3200]
 5. Approved equal.

2.03 EXPANSION ANCHORING SYSTEMS FOR CONCRETE

- A. Expansion anchoring systems shall have current ICC or IAPMO reports for shear and tension in cracked concrete per the requirements of the California building code. Expansion anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:
1. Kwik Bolt TZ; Hilti [ICC ESR 1917].
 2. Strong bolt 2 wedge anchors; Simpson Strong Tie [ICC ESR 3037].
 3. Power-stud+ sd2; dewalt\powers fasteners [ICC ESR 2502].
 4. Approved equal.

2.04 EXPANSION ANCHORING SYSTEMS FOR grouted CONCRETE block

- A. Expansion anchoring systems shall have current ICC or IAPMO reports for shear and tension in grouted concrete block per the requirements of the California building code. Expansion anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:
1. Kwik Bolt 3; Hilti [ICC ESR 1385].
 2. Wedge All Anchors; Simpson Strong Tie [ICC ESR 1396].
 3. Power-Stud+ SD1; DeWalt\Powers Fasteners [ICC ESR 2966].
 4. Approved equal.

2.05 THREADED ANCHORING SYSTEMS FOR CONCRETE AND GROUTED CONCRETE BLOCK

- A. Threaded anchoring systems shall have current ICC or IAPMO reports for shear and tension in cracked concrete and grouted concrete block per the requirements of the California building code. Threaded anchors shall be used in strict accordance with manufacturer's recommendations. Subject to compliance with requirements provide one of the following:

SECTION 037010 – POST INSTALLED ANCHORS

1. Kwik HUS-EZ; Hilti [ICC ESR 3027].
2. Titen HD; Simpson Strong Tie [ICC ESR 2713].
3. Titen concrete and masonry screw; Simpson Strong Tie.
4. Screwbolt+; Dewalt\Powers Fasteners [ICC ESR 3889-concrete].
5. Approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of post installed anchors, including drilling and cleaning of holes, shall be in accordance with the current ICC or IAPMO report and the manufacturer's recommendations.
- B. Holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the holes. Holes drilled through members or into thin elements such as walls or slabs shall utilize rotary drills to avoid impact damage to the opposite side of the member.
- C. Holes in which longitudinal or transverse reinforcement is encountered during drilling before the specified depth is attained shall be rejected. A new hole, which does not strike reinforcement, shall be drilled adjacent to the rejected hole to the depth shown on the plans. Abandoned holes shall be patched with high strength grout or other material approved by the engineer.
- D. The contractor shall use non-destructive methods to locate existing reinforcement prior to drilling where designated on the plans at no additional cost.
- E. Any dowels which fail to bond or are damaged before new concrete is placed shall be removed and replaced at the contractor's expense.
- F. Adhesive anchors shall be installed in concrete having a minimum age of 21 days at the time of anchor installation.
- G. Installation of adhesive anchors that are to be under sustained tension loading in horizontal to vertically overhead orientation shall be done by a certified adhesive installer (AAI) as certified through ACI and in accordance with ACI 318 Section D.9.2.2. Proof of current certification shall be submitted to the engineer for approval prior to the commencement of installation.

3.02 FIELD QUALITY CONTROL

- A. Testing and inspections: the City's agent will perform the inspections shown on the contract drawings for the placement of post installed anchors.

SECTION 037010 – POST INSTALLED ANCHORS

- B. Test results: test results shall be reported in writing to the architect and contractor on a weekly basis, but no later than 5 working days after the end of the week in which the tests were performed.
- C. Additional tests: additional testing required due to failure of post installed anchors to achieve the specified requirements shall be performed by the City's agent at the contractor's expense.

END OF SECTION

DIVISION 04
MASONRY

SECTION 042200

CONCRETE MASONRY UNIT

PART 1 - GENERAL

1.01 GENERAL

- A. Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. Summary: The work included under this section consists of furnishing all materials, supplies, equipment, tools, scaffolding, transportation and facilities and performing all labor and services necessary for or required in connection with or properly incidental to furnishing and installing all masonry construction as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied there from except as hereinafter specifically excluded.
- B. Work Included:
1. All masonry work as specified and as shown on the Drawings.
 2. Concrete unit Masonry (CMU), types as scheduled in Part 2.
 3. Providing, fabricating and placing reinforcing steel for masonry work.
 4. Placement of anchor bolts, assemblies, and embeds.
 5. Grouting of plates and embeds.
- C. Related Work Specified Elsewhere:
1. Section 033000, CAST-IN-PLACE CONCRETE.
 2. Section 032000, REINFORCING STEEL.
 3. Section 032000, REINFORCING STEEL, for reinforcing steel within CMU construction.
 4. Section 033000, CAST-IN-PLACE CONCRETE, for concrete slabs, walls, and footings.
 5. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for steel framing integrated into CMU work.
 6. Section 055000, METAL FABRICATIONS, for steel gates, site walls and miscellaneous metal fabrications integrated into CMU work.
 7. Section 071900, WATER REPELLENTS, for clear penetrating water-repellent treatments for all exterior exposed CMU surfaces.

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8. Section 072726, FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER, for waterproof membrane installed over CMU to receive rain screen panel system.
9. Section 099123, INTERIOR PAINTING, for painting of interior exposed CMU surfaces as indicated and as scheduled on the Drawings.

1.03 REFERENCES

- A. The following is a list of reference standards referred to in this portion of the specification:
 1. ASTM C5, Specification for Quicklime for Structural Purposes.
 2. ASTM C90, Specification of Hollow Load-Bearing Concrete Masonry Units.
 3. ASTM C144, Specification for Aggregate for Masonry Mortar.
 4. ASTM C150, Specification for Portland Cement.
 5. ASTM C207, Specification for Hydrated Lime for Masonry Purposes.
 6. ASTM C404, Specification for Aggregates for Masonry Grout.
 7. ASTM C270, Specification for Mortar for Unit Masonry.
 8. ASTM C476, Specification for Grout for Masonry.
 9. ASTM C979, Specification for Pigments for Integrally Colored Concrete.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. California Building Code, current governing edition.
 2. ACI 530.1 "Specification for Masonry Structures," current governing edition.
- B. Certificates of Compliance: The Contractor shall provide Certificates of Compliance for concrete masonry units and grout materials in accordance with the requirements of Part 1.05, "Submittals," of these specifications.
- C. Testing and Inspection:
 1. City: The City shall employ an independent testing laboratory or the engineer as the City's agent to perform the inspections and tests shown on the contract drawings, and submit certified test results. The contractor will cooperate with and notify City's agent at least 48 hours in advance of inspections required.
 2. Contractor:
 - a. The Contractor shall hire a professional testing laboratory to provide a grout mix design. The mix design shall be verified by test and certified to by a principal of the laboratory who is a registered Civil

SECTION 042200 – CONCRETE MASONRY UNIT

Engineer in the State of California and submitted to the Engineer for review.

3. Engineer:
 - a. The Engineer shall review grout mix design prepared by testing laboratory.

- D. Mockups: Build mockups to set quality standard for materials and execution.
 1. Build mockups for each type and pattern of exterior wall in sizes approximately 72 inches long by 48 inches high by full thickness, including accessories.
 2. Include a sealant-filled joint.
 3. Include special features and on corner angle.
 4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 5. Protect accepted mockups from the elements with weather-resistant membrane.
 6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.
 7. Approved mockups may become part of the completed Work.

1.05 SUBMITTALS

- A. General Requirements:
 1. Submittals shall be made to Architect in accordance with the requirements of Division 01, General Requirements, of these specifications.
 2. Construction and fabrications or mixing of materials shall not begin until contractor has received submittals reviewed by Architect/Engineer governing all aspects of the intended work.

- B. Product Data:
 1. Manufacturer's catalog sheets including instruction for use and description of applications shall be provided for each type of product indicated.

- C. LEED Submittals:
 1. Product Certificates for Credit MR 5.1 and Credit MR 5.2: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

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- D. Samples: Submit masonry unit and colored mortar samples for each different type, texture, and color specified for approval.
- E. Certificates of Compliance:
 - 1. The Contractor shall provide Certificates of Compliance for each type of aggregate, cement and admixture to be used in grout. Contractor shall also provide certificates of compliance for each type of concrete unit masonry.
 - 2. Certificates of Compliance shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds specified requirements. Material certificates shall include laboratory test reports showing compliance for the material proposed for use.
 - 3. Where Certificates of Compliance cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance of each type of material proposed for use. The cost of testing shall be paid for by the Contractor.
- F. Laboratory Test Reports: Laboratory test reports shall show the name of testing agency, date of testing and shall be signed by an agent of the testing agency. Laboratory test shall not be older than 8 months. Submit laboratory test reports for grout materials, concrete unit masonry and mix designs as specified.
- G. Mix designs: Mix designs shall be submitted for each type of grout and each type of mortar. Mix designs shall show names and brands of all materials, proportions, slump, strength and location to be used on job.
- H. Control joint layout plans: Plans shall be submitted for every floor showing specific control joint locations and details.

1.06 DELIVERY STORAGE AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

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- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- F. Take all means necessary to protect unit masonry before, during, and after installation, and to protect the installed work of other trades.

1.07 SEQUENCING AND SCHEDULING

- A. Obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installations of items furnished by them to be embedded in masonry work so provision for their work can be made without delaying the project.
- B. Do any cutting and patching made necessary by failure or delay in complying with these requirements, at no cost to City.
- C. Contractor shall provide 48 hours' notice to City prior to any grout pour to allow City sufficient time to notify inspector.

1.08 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Prevent mortar and soil from staining the face of masonry to be left exposed or painted. Immediately remove mortar and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
- C. Cold-Weather Requirements:
 - 1. Do not use frozen materials or materials mixed or coated with ice or frost.
 - 2. Do not build on frozen substrates.
 - 3. Remove and replace unit masonry damaged by frost or by freezing conditions.
 - 4. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602
 - 5. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

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- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products name or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Concrete Unit Masonry (CMU):
 - 1. Angelus Block Company, Inc., Orange Plant, 1705 N. Main St., Orange, CA 92865; Telephone: 714-637-8594; FAX 714-921-0281; Website: www.angelusblock.com.
 - 2. Or approved equal.

2.02 PORTLAND CEMENT

- A. Portland Cement shall conform to ASTM C150 for Type II cement. Use a single, approved standard brand throughout work.

2.03 WATER

- A. All water used for mortar and grout shall be clean and free from deleterious amounts of acids, salts, alkalis, and organic materials.

2.04 HYDRATED LIME

- A. All hydrated lime shall conform to ASTM C207, Type S.

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2.05 QUICKLIME

- A. All quicklime shall conform to ASTM C5.

2.06 LIME PUTTY

- A. All lime putty shall be made from hydrated lime or quicklime. If made from quicklime, other than pulverized (processed) quicklime, the lime shall be properly slaked and then screened through a sieve having not less than 16 meshes per linear inch.
- B. After screening, and before using, the slaked lime shall be properly stored and protected for not less than 10 days. If made from pulverized (processed) quicklime, the lime shall be properly slaked for not less than 24 hours or until the lime putty has entirely cooled. All resulting lime putty shall weigh not less than 83 lbs per cubic foot.

2.07 AGGREGATES

- A. Mortar: Aggregate shall conform to ASTM C144 except that not less than 3 percent of the sand shall pass the No. 100 sieve, uniformly graded fine to coarse.
- B. Grout: Size No. 8 coarse aggregate and shall conform to ASTM C404 Table 1,

2.08 CONCRETE MASONRY UNITS

- A. All concrete masonry units shall be hollow and suitable for bearing wall construction. All blocks shall be medium concrete and shall conform to the requirements of ASTM C90.
 - 1. In addition, the units shall have a maximum linear shrinkage of 0.05 percent for the saturated state to the oven dry condition.
 - 2. Masonry units shall have cured for not less than 28 days when placed in the structure. Minimum net area compressive strength of the units shall be 1900 psi.
 - 3. Other miscellaneous sizes may be required for construction but shall match these basis units in color and texture. The specified compressive strength shall be $f'_m=1,900$ psi.
- B. Concrete Masonry Unit Types (By Angelus Block):
 - 1. Type 1: Burnished, nominal 8W and 12W x 8H x 16L for exposed exterior walls of the Fire Station, trash enclosure and BBQ; "Canyon Bluff."
 - 2. Type 2: Burnished, nominal 8W and 12W x 8H x 16L block for exposed exterior walls of the Fire Station: "Greystone."

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3. Type 3: Precision, nominal 8W and 12W x 8H x 16L block for the exterior (concealed behind rainscreen) and interior walls of the fire station.

2.09 MORTAR MIX

- A. Mortar shall conform to ASTM C270 Type S or M and shall develop a minimum compressive strength of 1900 psi at 28 days.
- B. Mortar Pigments:
 1. Natural and synthetic iron oxides and chromium oxides, non-fading, alkali and lime proof, compounded for use in mortar mixes and complying with ASTM C979. Use only pigments with a record of satisfactory performance in masonry mortar.
 2. Provide integral color as selected by Architect from “Tamms Palette” or approved equal.

2.10 GROUT MIX

- A. Grout shall be coarse grout and shall conform to ASTM C476 and shall have a minimum compressive strength of 2500 psi at 28 days. Slump shall be 8 inches to 10 inches.

2.11 ADMIXTURES

- A. Mortar Admixture: None without prior approval of Engineer
- B. Grout Admixture: Sika Grout Aid II or equal.

2.12 REINFORCING STEEL

- A. Reinforcing steel shall be provided and fabricated in accordance with the requirements of Section 032000, REINFORCING STEEL, of these specifications.
- B. TIES AND ANCHORS
- C. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82; with ASTM A153, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008, Commercial Steel, with ASTM A153, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A36.

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- D. Anchor Bolts shall be provided and fabricated in accordance with the requirements of Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, of these specifications.

2.13 SEALER

- A. Sealer for masonry work shall be a clear silicone water repellent as manufactured by:
 1. Standard Drywall Products: Thoroclear 777.
 2. Pro So Co: Siloxane.
 3. Chemprobe Corp. Prime-A-Pell 200.
 4. Price Research Ltd: Price-Seal 5.
 5. Approved Alternate.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. All masonry shall be laid plumb, true to line, with level and accurately spaced courses. Work required to be built in with the masonry, including anchors, shall be built in as the wall construction progresses.
- B. Basic layouts, positions, and elevations shall be as shown on the contract documents. Unit layouts within each panel or wall area shall be made to achieve symmetrical, uniform appearance and to avoid cut units where possible.
- C. Standard width of mortar joints for both horizontal and vertical joints shall be 3/8-inch. Joints on exposed surfaces shall be raked joints. Joints shall be tooled in such a manner as to squeeze the mortar back into the joints, and then raked. No tooling shall be done until after the mortar has taken its initial set. After tooling, the exposed surfaces shall be wiped down with burlap.
- D. Set block units in full mortar beds with full mortar head joints. Cells shall be in vertical continuity. Remove excess mortar from cells as work progresses.
- E. Walls shall have vertical control joints at a spacing approximately 1.5 times the wall height, but no greater than 20 feet on center.
- F. Cutting and patching of masonry required to accommodate the work of others shall be performed by masonry mechanic. Work shall be neatly performed using approved power saws.

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- G. Unfinished work shall be stepped back for joining with new work. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted before laying new work.
- H. Perform no work during rain or when outside temperature is 40 degrees F or lower, or when it appears probable that temperatures below 40 degrees F will be encountered before the mortar or grout has set.
- I. TOLERANCES
- J. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2-inch or minus 1/4-inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2-inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4-inch in a story height or 1/2-inch total.
- K. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4-inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
- L. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8-inch, with a maximum thickness limited to 1/2-inch.
 - 2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8-inch or minus 1/4-inch.
 - 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8-inch.

3.02 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

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- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Bond Pattern for Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Fill all cores in hollow CMUs with grout.
- H. Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections greater than 1/4-inch, mortar droppings and other foreign material, per CBC Section 2104A.1.3.
- I. Fully bond intersections and external and internal corners.
- J. Do not shift or tap masonry units after mortar has taken initial set. Where adjustments must be made, remove mortar and replace.
- K. Remove excess mortar.
- L. Perform job-site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

3.03 MORTAR MIXING

- A. Perform all measurements of materials for mortar accurately using suitable calibrated devices. Shovel measurements will not be acceptable. 94 lbs of Portland Cements (1 sack) shall be considered as 1 cubic foot.
- B. Use mixers of at least 1 sack capacity. Batches requiring fractional sacks will not be permitted unless the cement is weighted for each such batch.
- C. Place the sand, cements and water in the mixer in that order for each batch of mortar and mix for a period of at least 2 minutes. Add the lime and continue

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mixing for as long as needed to secure a uniform mass, but in no case less than 10 minutes.

- D. Retempering of mortar by dashing water over the mortar will not be permitted. Retemper mortar only by adding water into a basin made with the mortar and then carefully working the water into the mortar.
- E. Mix the mortar and maintain it on the boards to a slump of 2-3/4 inches plus or minus 1/4-inch using a truncated cone 4 inches by 2 inches, 6 inches high. All mortar which is unused within 1 hour after the initial mixing shall be removed from the work.

3.04 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints solidly and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Verify all types of mortar joints with the Architect before proceeding with block laying. Tool joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. Vertical Joints: Compressed, Raked, and Tooled joints.
 - 2. Horizontal Joints: Compressed, Raked, and Tooled joints.
- D. Provide compressed flush joints when other materials (other than paint) are to be applied directly onto and over concrete masonry units being covered (including areas to be covered by rubber base).
- E. Align vertical cells to maintain vertical continuity of cells to be filled. Open end or notched units may be used to facilitate installation around cells that contain vertical reinforcement. Minimum unobstructed vertical flue 3 inches x 3 inches. Remove overhanging mortar or other obstructions or debris from inside of cells.
- F. Provide bond beam units at cells containing horizontal reinforcement.

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3.05 REINFORCING STEEL

- A. Reinforcing steel shall be placed in accordance with the requirements of Section 032000, REINFORCING STEEL, of these Specifications and the requirements of this Specification Section.
 - 1. Bars shall conform accurately to the sizes, shapes, lines and dimensions shown on drawings and with hooks and beds made as detailed. Bars shall be placed as indicated on the drawings and centered on grout space.
 - 2. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of bars for bending will not be permitted.
- B. Reinforcing steel shall have contact lap splices that are wired tight together. Where dowels are allowed on the structural drawings, reinforcing steel shall be wired tight to dowels.
- C. Wire horizontal and vertical bars together.
- D. Reinforcing steel shall be coordinated with the control joint layout to provide additional reinforcing as shown on the drawings.
- E. Installation of Vertical Reinforcement Bars:
 - 1. Where possible, bars shall be one length and centered in open end of Concrete Masonry Units unless noted otherwise on drawings.
 - 2. Bar may be doweled at top of footing.
 - 3. Bars shall be accurately and positively held in place before setting Concrete Masonry Units by wiring to a 2 x 6 properly braced near top of bars and not over 8 feet above foundation or at last Grout pour.
 - 4. For Low Lift Grout, corner bars and other bars in closed cell units shall be lapped a minimum of 48 bar diameters, unless indicated otherwise.
 - 5. All vertical reinforcing steel shall be braced throughout its height in a manner that will retain the steel in proper position and provide the proper clearance at spacing not to exceed 192 bar diameters.
- F. Installation of Horizontal Reinforcing Bars:
 - 1. Bars shall be laid in bond beam units directly on top of the cross walls of block webs.
 - 2. Lap splice bars a minimum of 48 bar diameters, unless indicated otherwise.
 - 3. Reinforcing steel shall be secured to all foundation dowels and held in place at spacing not to exceed 192 bar diameters.
- G. At the time grout is placed around it, reinforcing steel shall be clean of mill scale or other coatings that will destroy or reduce bond.

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3.06 WORKMANSHIP

- A. Fill all cells solid with grout. Provide cleanouts in accordance with the California Building Code current governing edition.
- B. Do not place pipes or conduits in any structural masonry, except that rigid electric conduit may be embedded in structural masonry when its location has been detailed on the structural contract drawings.
- C. Do not form chases or recesses not shown on structural contract drawings.
- D. Do not use chipped or cracked blocks. If any such blocks are discovered in a finished wall, promptly remove them and replace with new blocks to the approval of the Architect and at no additional cost to the City.

3.07 GROUTING

- A. General:
 - 1. All cells shall be grouted solid.
 - 2. Use low lift or high lift grouting at Contractor's option.
 - 3. Use grout pump, hopper or bucket to place grout.
 - 4. Place grout in final position within 1-1/2 hours after introduction of mixing water.
 - 5. Place grout and rod with a 3/4-inch flexible cable vibrator sufficiently to case it to flow into all voids between the cells and around the reinforcing steel. Slushing with mortar will not be permitted.
 - 6. Stop grout approximately 1-1/2 inches below top of last course, except at top course bring grout to top of wall.
- B. Low Lift Grouting Procedure: Construction procedure shall be in accordance with ACI 530.1 and as follows:
 - 1. Set all vertical bars.
 - 2. Concrete Masonry Unit walls shall be built up 16 inches high uniformly around one complete building unit. No vertical construction joints will be allowed unless noted and detailed on the drawings.
 - 3. Lay Concrete Masonry Units no higher than 5 feet and clean cells or mortar. Lay Concrete Masonry Units no higher than 4 feet and clean cells of mortar.
 - 4. Set horizontal bars on bond beam unit crosswalls next to verticals.
 - 5. If course at top of lift contains horizontal reinforcement, grout all cells to a level 3/4-inch below the top of the Concrete Masonry Units. This will provide about 1-1/4-inch grout cover over the horizontal bar. Puddle grout in place using a No. 4 bar or a 1 x 2 stick and repeat puddling in 30 to 60 minutes.
 - 6. Consolidate each grout lift twice using mechanical vibrators. Once while placing grout and once more after initial absorption of water but before set.
 - 7. Repeat steps "3." through "6." above until the wall is completed.

SECTION 042200 – CONCRETE MASONRY UNIT

- C. High Lift Grouting Procedure (only upon prior approval of DSA, Architect, and Structural Engineer) shall be in accordance with CBC Section 2104A.1.3.1.2.3.:
1. Clean-outs must be provided at the bottom of each pour for each cell. Alternatively, if the course at the bottom of the pour is constructed entirely of inverted double open-end bond beam units, cleanout openings need only be provided for access to every reinforced cell at the bottom of each pour grout.
- D. Construct clean out courses with inverted open-bottom bond beam units involved to permit cleaning of all cells by flushing. Cleanouts shall not be less than 3- x 4-inch openings cut from one full shell. Do not plug cleanout holes until masonry work, reinforcement and final cleaning of the grout spaces have been completed and inspected.
- E. After the laying of the masonry units is completed, the cells cleaned, the reinforcing positioned, and inspection completed, close the cleanouts by inserting face shells of masonry units or covering the openings with forms. Face shell plugs shall have a 2-day minimum curing time and shall be adequately braced to resist the pressure of the fluid grout.
1. The Contractor shall submit an alternate grout mix design that is in compliance with CBC Section 2104A.1.3.1.2.3 and incorporates an admixture that reduces early water loss and produces an expansive action shall be used in the grout.
 2. The Contractor is cautioned that with the high lift method, the walls have very little lateral stability against winds or earthquake before grout has set and it shall be this Contractor's responsibility to adequately brace the walls until the roof sheathing is installed.
 3. "Dur-O-Wall" reinforcing shall be provided in mortar joints at all wall corners, ends, jambs of openings and wall intersections.
 4. Lay-up walls subject to maximum height limitations of CBC Section 2104A.1.3.1.2.2 or 2104A.1.3.1.2.3.
 5. Construction procedure shall be as follows:
- F. Set all full-length vertical bars on center line of wall, centered in cells, and braced as noted above under typical reinforcing.
- G. Lay Concrete Masonry Units full height of walls, or 12 feet maximum including wiring horizontal bars to verticals, for one complete building unit. No vertical construction joints will be allowed unless noted and detailed on the drawings.
- H. Construct clean out courses with open-bottom bond beam units inverted to permit cleaning of all cells by flushing. Cleanouts shall not be less than 3- by 4-inch openings cut from one full shell. Do not plug cleanout holes until masonry work, reinforcement and final cleaning of the grout spaces have been completed and inspected.

SECTION 042200 – CONCRETE MASONRY UNIT

- I. Clean all cells and top of foundation wall of mortar by hosing cells with suitable nozzle jet or sandblasting as soon as mortar has partially set. Final cleaning shall be inspected through clean-outs at each cell in base of wall. Remove all mortar fine protruding more than 1/2-inch into the grout space by dislodging the projections with a rod as the work progress or by washing the grout space at least twice a day during erection using a high pressure stream of water.
- J. Set vertical bars in closed cells where required; i.e., at wall corners, sides of openings, etc. Wire to horizontals at top and bottom. Use metal spacers at 48 inches o.c. maximum to hold bars in line.
- K. No grout shall be placed until mortar has set a minimum of 3 days in hot weather or 5 days in cold weather, and the top of foundation wall has been thoroughly cleaned and grout plugs have cured a minimum of 48 hours.
- L. Place grout in lifts not to exceed 4 feet in height, with a waiting period between lifts, dependent on weather and absorption rate of the masonry, in order to place the succeeding lift after the preceding lift becomes plastic but prior to initial set. The first lift shall be consolidated using mechanical vibrators. After the required waiting period, place the second lift and consolidate with the vibrator, reconsolidating the lift below to a depth of 12 to 18 inches. Repeat the waiting, placing, and consolidating process until the top of the grout pour is reached. Reconsolidate the top lift after the required waiting period. The high-lift grouting of any section of wall between lateral flow barriers shall be completed to the top of a pour in one working day unless a new series of clean out holes is established and the resulting horizontal construction joint cleaned.
- M. Repeat steps “a” through “g” until all cells are filled. The wall must be grouted to its full height during one working day. No horizontal construction joints will be allowed.
- N. Above 12 feet level low lift grouting procedures shall be used.
- O. CURING
- P. While Concrete Masonry Units are being laid and after, dampen both faces for a period of 3 days using a regulated fog spray of water sufficient only to moisten faces of masonry but not in an amount to cause water to flow down over masonry. After grouting, dampen for a minimum period of 24 hours.
- Q. Do not saturate masonry with water for curing or any other purposes and protect from rain or flooding during curing period.

3.08 PROTECTION OF WORK

- A. Protect adjacent construction and previously placed masonry against damage by materials or operations under this Section.

SECTION 042200 – CONCRETE MASONRY UNIT

- B. Protect masonry work under construction using heavy moisture-resistant coverings well secured in place when rain or frost is imminent; when day's work is stopped; when lay-up work is subjected to extremely hot winds within 72 hours after placing; or when the work is waiting for grouting.
- C. All masonry walls shall be adequately braced against lateral loads during construction.

3.09 FIELD QUALITY CONTROL

- A. The City will employ an independent testing laboratory to perform the tests and inspections shown on the contract drawings and submit certified test reports. The Contractor will cooperate with City's agent and notify City's agent 48 hours prior to all required testing and inspection.
- B. Test Results: Test reports shall be submitted in writing to Architect/Engineer and Contractor within 7 days after tests are made. Test results not in compliance with requirements of these specifications shall be reported verbally to the Architect/Engineer and Contractor within 24 hours of the tests. Reports of compressive strength test shall contain the project identifications name and number, date of grout or mortar placements, name of testing service, product type and class, location of batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- C. Additional Tests: The testing services will make additional tests of in-place masonry and grout when test results indicate specified strengths and other characteristics have not been attained in the structure, by methods as directed by the Engineer. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable masonry construction is verified.

3.10 WALL CLEANING AND PROTECTION

- A. It shall be the responsibility of the masonry contractor to provide a finish surface acceptable to the Architect. All exterior exposed-to-view masonry surfaces shall be cleaned thoroughly with a bristle brush and water (do not use steel wool) to remove latents, spills, etc.
- B. Solutions or agents for cleaning or other purposes shall not be applied or used on masonry work unless thoroughly tested and determined by Contractor to have not damaging effect to the masonry or adjacent work.

SECTION 042200 – CONCRETE MASONRY UNIT

- C. Remove of stains and efflorescence:
 - 1. Removal of Stains: In accordance with NCMA TEK Bulletin 08-02A “Removal of Stains from Concrete Masonry” and as recommended by the masonry unit manufacturer.
 - 2. Removal of Efflorescence: In accordance with NCMA TEK Bulletin 08-03A “Control and Removal of Efflorescence” and as recommended by the masonry unit manufacturer.

3.11 DAMPROOFING

- A. Masonry surfaces shall be sealed with a clear silicone water repellent in accordance with manufacturer's recommendations. See Part 2, Products, of this specification section for acceptable sealers.
- B. Acceptance condition of surfaces: All surfaces that are to be sealed shall be free of dust, dirt, oil, grease, and other foreign material and must be dry to the degree required for satisfactory reception of the sealer. Surfaces shall not be acceptable for sealing if they contain cracks or voids in excess of 1/32-inch in width.
- C. Moisture Content: The optimal acceptable levels of moisture are the following: Inside the substrate – 14 percent; surface of substrate – 7 percent, when measured by an electronic moisture meter. New concrete or masonry shall have cured for at least 40 days under normal warm-weather conditions prior to any application. Depending on the severity of a preceding rain, at least seven days must elapse before application. If there is any question concerning the amount of moisture in the substrate following a rain, the moisture meter shall be used to verify actual conditions. No material shall be applied if there is any chance of rain during the following 24 hours.
- D. Application: Application shall be by skilled applicators approved by the manufacturer using methods and equipment approved by the manufacturer. A Hudson sprayer may not be used.

END OF SECTION

DIVISION 05
METALS

SECTION 051200

STRUCTURAL STEEL AND MISCELLANEOUS IRON

PART 1 - GENERAL

1.01 APPLICABLE SECTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this Section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, fabricating, priming, and erecting structural steel and miscellaneous iron complete in place, as described in this Section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
 - 1. All structural steel indicated on the drawings.
 - 2. Furnishing all column anchor bolts and base assemblies with nuts and washers.
 - 3. Supervision of the placement of anchor bolt assemblies
- C. Related Work Specified Elsewhere:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE.
 - 2. Section 033000, GROUTING OF COLUMN BASES.
 - 3. Section 033000, CONCRETE FLOOR HARDENER/SEALER, and Section 042200, CONCRETE MASONRY UNIT, for Placement of Anchor Bolts, Assemblies, and Embeds.

1.03 REFERENCE STANDARDS

- A. The following is a list of reference standards referred to in this portion of the specification:
 - 1. ASTM A36, "Specification for Carbon Structural Steel."
 - 2. ASTM A53, "Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless."

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3. ASTM A307, “Specification for Carbon Steel Bolts and Studs.”
4. ASTM A500, “Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.”
5. ASTM A572, “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.”
6. ASTM A992, “Specification for Steel for Structural Shapes for use in Building Framing.”
7. ASTM F1554 “Specification for Anchor Bolts, Steel.”
8. ASTM F3125 “Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated.”
9. SSPC, “Systems and Specifications, Steel Structures Painting Manual Volume 2” by Steel Structures Painting Council.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State, and Local codes and safety regulations. In addition, the fabrication, priming, and erection of structural steel shall comply with all the applicable provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings” by the American Institute of Steel Construction, current edition.
 2. “Codes of Standard Practice for Steel Buildings and Bridges” by said AISC, current edition.
 3. A.W.S. “Structural Welding Code – Steel,” D1.1, current edition.
 4. A.W.S. “Structural Welding Code – Seismic Supplement,” D1.8, current edition.
 5. “Specifications for Structural Joints using ASTM A325 or A490 bolts,” current edition as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation, and endorsed by the AISC.
- B. Qualifications: Welding processes and welding operators shall be qualified in accordance with AWS “Standard Qualification Procedure.” Welders to be employed are to provide AWS certification for the type of welding necessary.
- C. Mill Certificates: The Contractor shall provide Mill Certificates for structural steel and miscellaneous iron in accordance with the requirements of Part 1.05, Submittals, of this Specification Section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05, Submittals, of this Specification Section.
- D. Sampling, Testing, and Inspection:
 1. General:

SECTION 051200 – STRUCTURAL STEEL AND MISCELLANEOUS IRON

- a. All materials and work shall be subject to inspection at the mill, the fabricating shop, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
- b. If the inspector, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
2. Owner: The Owner shall employ an independent testing agency or the Engineer as the Owner's agent to perform sampling, testing, and inspections as shown on the contact drawings and submit certified test results.
3. Contractor:
 - a. The Contractor shall cooperate with and notify Owner's agent at least 24 hours in advance of inspections required and shall supply samples, test pieces, and facilities for inspection without extra charge.
 - b. The Contractor shall identify and tag each lot of fabricated steel to be shipped to the site by heat numbers in such a manner that it can be accurately identified at the job site.
 - c. The Contractor shall remove all unidentified steel received at the site.

1.05 SUBMITTALS

- A. General Requirements
 1. Submittals shall be made to Architect in accordance with the requirements of Division 01, General Requirements, of these specifications.
 2. Construction, and fabrication or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.
- B. Shop Drawings:
 1. Shop drawings for steel fabrications shall be submitted for review.
 2. Submittals shall include anchor bolt setting plans, erection drawings and fabrication drawings. Information shown on the shop drawings shall include, but not be limited to, the following:
 - a. Anchor bolt setting plans shall show layout, anchor bolts sizes and grades, embedment, and template construction.
 - b. Erection Drawings shall show layout, marking and position of each member, and field connections.
 - c. Fabrication Drawings shall show details of members, including sizes, grades, connections, spacing of bolts and welds, designation of Architecturally Exposed Structural Steel, and the limits of paint applications.
 3. Partial submittals shall be clearly identified by the contractor.

SECTION 051200 – STRUCTURAL STEEL AND MISCELLANEOUS IRON

4. The omissions from the shop and installation drawings of any materials shown on the Specifications shall not relieve the contractor of the responsibility of furnishing and installing such materials, even though such drawings may have been returned and reviewed.
 5. Shop drawings and calculations for temporary shoring and bracing shall be submitted for review. The shop drawings shall show layout, size of members and connection details. Calculations shall show all stresses in members and connections, from dead, live, and lateral loads in accordance with the requirements of the C.B.C. current governing edition. Shop drawings and calculations for temporary shoring and bracing shall be stamped and signed by a civil engineer registered in the State of California.
 6. Contract drawings shall not be reproduced in whole or in part. Contract drawings modified into shop drawings will be returned without review.
 7. Revised submittals shall have clear indications of revised or new information. Clouding is an acceptable form of identification.
- C. Mill Certificates:
1. The Contractor shall provide Mill Certificates for each grade of steel for each heat to be used on project.
 2. Mill Certificates shall meet the requirements of AISC 360 and all applicable ASTM standards.
 3. Mill Certificates shall be furnished with each lot of material shipped to the site and shall be signed by the Contractor which will serve to certify that all structural steel materials installed comply with specified requirements.
 4. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance of each type of material to be used and provide laboratory test reports. The cost of testing shall be paid for by the Contractor.
- D. Laboratory Test Reports:
1. Laboratory test reports shall show the name of testing agency, date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered civil engineer in the State of California.
 2. When required by other portions of these specifications, laboratory test reports shall be submitted for each type of steel for each heat to show compliance with appropriate ASTM Standards and these specifications.
- E. Welding Procedure Specifications:
1. Welding procedure specifications for all prequalified joints shall be submitted per AWS D1.1, 5.1.2 to the Engineer and reviewed prior to beginning fabrication. Non prequalified joints shall be qualified per AWS requirements.

SECTION 051200 – STRUCTURAL STEEL AND MISCELLANEOUS IRON

1.06 DEFINITIONS

- A. Architecturally Exposed Structural Steel: Structural steel designated as “architecturally exposed structural steel” or “AESS” in the Contract Documents.
- B. Provide “AESS” as follows: Exposed structural steel that is within 16 feet vertically and 10 feet horizontally of a walking surface and is visible to a person standing on that walking surface.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Structural Steel Wide Flange and Tee Shapes: Shall be new and shall conform to the requirements of ASTM A992.
- B. Structural Steel Channels and Angles: Shall be new and shall conform to the requirements of ASTM A36.
- C. Structural Steel Plate: Shall be new and shall conform to the requirements of ASTM A572.
- D. Structural Steel Tubes: Shall be new and shall conform to the requirements of ASTM A500, Grade B.
- E. Steel Pipe: ASTM A53, Types E or S, Grade B, with sulphur not exceeding 0.05 percent.
- F. Arc-welding Electrodes: Arc-welding electrodes shall be E70 series electrodes for A36, A572 and A992 material, E80 Series for A706 reinforcing steel and E90 series for A615 reinforcing steel. Electrodes shall be as recommended by their manufacturers for the positions and conditions of actual use. All welds used in members and connections in the seismic Force Resisting System shall be made with filler metals meeting the requirements specified in AWS D1.8 clause 6.3.
- G. High Strength Bolts: High strength bolts (HSB) shall conform to ASTM F3125 Grade A325.
- H. Machine Bolts: Machine bolts (MB) and sag rods shall conform to ASTM A307, manufactured to American Standard Bolt and Nut dimensions with “Free Fit - Class 2” threads. All unfinished bolts shall have an approved lock washer under nut.

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- I. Prime Coat: Prime coat for interior members shall meet the requirements of SSPC-Paint 25 or acceptable equal. Prime coat for exterior members shall meet the requirements of SSPC-Paint 20 or acceptable equal.
- J. Smooth Rods: Smooth Rods shall conform to ASTM A36.
- K. Anchor Bolts: Anchor bolts shall conform to ASTM F1554 grade 36.
- L. Headed Studs, Deformed Bar Anchors, and Threaded Studs: Headed Studs shall be H4L or S3L; Deformed Bar Anchors shall be D2L and Threaded Studs shall be CPL as manufactured by TRW Nelson Stud or equal.
- M. High Strength Rods: High strength rods shall conform to ASTM F1554 grade 55, unless noted otherwise.
- N. Nuts shall be as shown below and finish shall match fastener.

	Fastener Grade & Size	Nut Class	Nut Style
Bolts			
ASTM F3125 Gr A325	Type 1, Uncoated	ASTM A563-C,C3,D,DH, DH3	Heavy Hex
	Type 1, Zinc Coated	ASTM A563-DH	Heavy Hex
	Type 3, Uncoated	ASTM A563-C3,DH3	Heavy Hex
ASTM F3125 Gr A490	Type 1, Uncoated	ASTM A563-DH,DH3	Heavy Hex
	Type 3, Uncoated	ASTM A563-DH3	Heavy Hex
Rods			
ASTM A1554	1/4-inch to 1-1/2-inch Uncoated	ASTM A563-A	Heavy Hex
	Over 1-1/2 inches to 3 inches Uncoated	ASTM A563-DH	Heavy Hex
	1/4-inch to 3 inches Zinc Coated	ASTM A563-DH	Heavy Hex

- O. Washers shall be flat circular, rectangular or square beveled washers and shall conform to ASTM F436 Type 1. Finish shall match nut. Washers shall be installed under the element being turned for A325 bolts and under both the head and the nut for A490 bolts.

2.02 FABRICATION

- A. Welding: Welding shall be by operators who are qualified by test as per AWS "Standard Qualification Procedure" to perform type of work required.
- B. High Strength Bolting: All high strength bolted connections shall be bearing type connections unless otherwise noted on the plans. Where noted on the plans, high strength bolted connections shall be slip critical type connections.

SECTION 051200 – STRUCTURAL STEEL AND MISCELLANEOUS IRON

- C. Bolts, rods, washers and nuts exposed to weather shall be hot dipped galvanized steel in compliance with ASTM A153.
- D. Straightness (camber and sweep) Tolerance:
 - 1. Unless otherwise noted, straightness tolerances shall be per ASTM A6.
 - 2. Sweep tolerance for channels and angles: Maintain a maximum variation of 1/8-inch times the number of feet of total length divided by five, unless alternate criteria is approved by the Engineer.
- E. Painting:
 - 1. Priming: Painting under this Section is limited to priming.
 - a. The prime coat shall be applied in the shop and touched up after erection. Anchor bolts and column assemblies 2 inches and more below finish floor shall be left unpainted. High strength bolted connections shall be left unpainted within 3 inches of connection.
 - b. Paint shall be delivered to shop in original sealed containers marked with manufacturer's name and brand identification.
 - c. Use paint as prepared by the manufacturer without thinning or other admixture unless so stated by the manufacturer. Execute painting on a dry clean surface, free from rust, loose scale or grease. Do not do any painting in temperatures lower than 45 degrees F.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. The workmanship shall be in accordance with AISC Standard Specifications, and shall be of the highest quality found in contemporary structural work.
- B. All exposed gaps or bolt holes as a result of slotted gusset plates or erection bolts shall be filled and ground smooth. Erection bolts shall be removed after welding. Exposed ends of pipes and hollow sections shall be sealed with a cap plate and ground smooth unless noted otherwise on the architectural drawings.
- C. For Architecturally Exposed Structural Steel (AESS) shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection. Handle and fabricate AESS with special care including the following:
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
 - 2. Grind sheared, punched, and flame-cut edges of AESS to remove burrs and provide smooth surfaces and edges.
 - 3. Fabricate AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.

SECTION 051200 – STRUCTURAL STEEL AND MISCELLANEOUS IRON

4. Fabricate AESS with exposed surfaces free of seams to maximum extent possible.
5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
7. Fabricate AESS to the tolerances specified in AISC 303 Section 10.2 for steel that is designated AESS.
8. Seal-weld open ends of hollow structural sections with 5/16-inch closure plates for AESS.
9. Ease exposed edges to a radius of approximately 1/32-inch radius, unless otherwise shown on the drawings. Miter exposed corner joints and machine fit to a hairline joint.
10. Coping and Blocking Tolerance: Maintain a uniform gap of 1/8-inch +/- 1/32-inch at all copes and blocks.
11. Joint gap Tolerance: Maintain a uniform gap of 1/8-inch +/- 1/32-inch.
12. Straightness (camber and sweep) Tolerance: Maintain one half the standard camber and sweep tolerances for rolled shapes in ASTM A6, per AISC 303 Section 10.2.2.

3.02 ERECTION

- A. The Contractor will be responsible to erect the complete structural frame plumb and true to line and grade, in conformance with the AISC Code of Standard Practice.
- B. Temporary Bracing and Shoring:
 1. The Contractor shall temporarily brace the frame in both directions and shall maintain columns plumb until the final connections of the framework and construction of diaphragms are complete.
 2. The Contractor shall provide such temporary shoring and additional bracing of steel frame as required to adequately and safely support any or all loads imposed upon the structure during construction.
 3. Submit shop drawings for temporary bracing and shoring in accordance with the requirements of Part 1.05, Submittals, of this Specification Section.
- C. Field Painting:
 1. After erection, all field welds, field bolts and abraded or scratched surfaces shall be cleaned and given an additional spot coat of the same paint used for the shop coat. The entire work shall be left in a neat, clean and acceptable condition.

SECTION 051200 – STRUCTURAL STEEL AND MISCELLANEOUS IRON

3.03 FIELD QUALITY CONTROL

- A. Inspections: The Owner's agent will perform the inspections shown on the contract drawings.
- B. Contractor:
 - 1. The Contractor shall hire the Engineer responsible for the design of temporary bracing and shoring to inspect the work as detailed on the reviewed shop drawings.
 - 2. The Engineer responsible for design, temporary bracing and shoring shall write a letter to the Architect certifying construction of temporary bracing and shoring is in accordance with the reviewed shop drawings, prior to start of construction requiring temporary bracing or shoring.

END OF SECTION

SECTION 053000

METAL DECKING

PART 1 - GENERAL

1.01 GENERAL

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. Summary: The work included under this Section consists of furnishing all materials, supplies, equipment, tools, transportation and facilities and performing all labor and services necessary for, required in connection with or properly incidental to installing all metal floor and roof deck as described in this Section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
 - 1. Provide and install metal floor decking.
 - 2. Fastening the metal deck to the structural steel framework.
- C. Related Work Specified Elsewhere:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE.
 - 2. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.

1.03 REFERENCE STANDARDS

- A. The following is a list of reference standards referred to in this portion of the specifications:
 - 1. ASTM A653, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.”

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State, and Local codes and safety regulations. In addition, the fabrication and erection of metal decking shall comply with all the applicable provisions of the following codes,

SECTION 053000 – METAL DECKING

specifications, and standards, except where more stringent requirements are shown or specified:

1. "California Building Code," current governing edition.
2. "Code of Recommended Practice," Steel Deck Institute, current edition.
3. "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members," American Iron and Steel Institute.
4. "Steel Products Manual – Carbon Steel Sheets," American Iron and Steel Institute.

- B. Mill Certificates: The Contractor shall provide Mill Certificates for metal decking in accordance with the requirements of Part 1.05, Submittals, of this specification section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05, Submittals, of this specification section.
- C. ICC Approvals: Each type of metal decking proposed for use on project shall have ICC approval for vertical load and diaphragm rating capacities in accordance with the requirements shown on the structural drawings or required by these specifications. The Contractor shall provide I.C.C. Reports in accordance with the requirements of Part 1.05, Submittals, of this specification section.
- D. Sampling, Testing and Inspection:
1. General:
 - a. All materials and work shall be subject to inspection at the mill, the fabricating shop, and at the building site. Material or workmanship not complying fully with the drawings, and/or specifications will be rejected.
 - b. If the inspector, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
 2. Contractor:
 - a. The Contractor shall identify and tag each lot of decking to be shipped to the site by heat number in such a manner that it can be accurately identified at the job site.
 - b. The Contractor shall remove all unidentified metal decking received at the site.

1.05 SUBMITTALS

- A. General Requirements
1. Submittals shall be made to Architect in accordance with the requirements of Division 01, General Requirements, of these specifications.
 2. Construction, and fabrication or ordering of materials shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.

SECTION 053000 – METAL DECKING

- B. Shop Drawings: Shop Drawings shall be submitted that show diagrammatic plan layout of all metal decking, at a scale sufficiently large to show clearly the positions and erection marks of the pieces. All decking attachment and necessary shoring should be noted. Shop Drawings used in field must be reviewed copies.
- C. Product Data: Manufacturer's catalog sheets including instruction for use and description of application shall be provided for each type of metal decking. ICC approval of each type of metal decking for vertical load capacity and diaphragm rating capacity shall also be included.
- D. Mill Certificates:
 - 1. The Contractor shall provide Mill Certificates for each heat of each type of metal decking to be used on project.
 - 2. Mill Certificates shall include name of mill, date of rolling, date of shipping, yield point and minimum tensile strength.
 - 3. Mill Certificates shall be provided with each lot of material shipped to the site and shall be signed by the Contractor which will serve to certify that all metal decking materials installed comply with specified requirements.
 - 4. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance and provide laboratory test reports. The cost of testing shall be paid for by the Contractor.
- E. Laboratory Test Reports:
 - 1. Laboratory test reports shall show the name of testing agency, date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California.
 - 2. When required by other portions of these specifications, laboratory test reports shall be submitted for each deck type tested to show compliance with appropriate ASTM Standards and these specifications.
- F. ICC Certificates: The Contractor shall provide ICC Certificates for each type of metal decking proposed that includes vertical and lateral load capacities.

PART 2 - PRODUCTS

2.01 METAL FLOOR DECK

- A. Metal floor deck shall conform to the requirements shown on the plans and have current ICC reports for vertical and lateral load resistance per the requirements of the California Building Code. Metal deck and all flashing shall be formed of zinc-coated (galvanized) steel sheets of the size and gage called for on the structural drawings. Furnish minimum lengths called for on the structural drawings. Metal Deck supporting concrete shall be vented. Subject to compliance with requirements provide one of the following:
 - 1. W2 Formlok; Verco [IAPMO ER #2018].

SECTION 053000 – METAL DECKING

2. Approved Equal.
- B. Zinc Coating: Zinc coating (galvanizing) shall be in accordance with ASTM A653, G60 commercial coating class for interior use or G90 commercial coating class for external use.
 1. ER3.5A; Epic Metals [IAPMO ER #226].
 2. Approved Equal.
- C. Zinc Coating: Zinc coating (galvanizing) shall be in accordance with ASTM A653, G60 commercial coating class for interior use or G90 commercial coating class for external use.

PART 3 - EXECUTION

3.01 ERECTION

- A. Erection shall be by an installer fully familiar with the manufacturer's product and having previous experience in its installation.
- B. Erection shall be in strict accordance with the manufacturer's standard requirements. Alignment, end lap, side lap, bearing, closures, field cutting, field welding, and other like items concerned with a proper installation shall be in accordance with the manufacturer's recommended construction specifications. Care shall be exercised to properly fit male-female units of side laps before crimping or connecting.
- C. The Contractor shall determine construction shoring requirements, construction load deck deflections, and construction load carrying capacities for the steel deck. At the Contractor's option and expense, the Contractor may increase the deck gage if beneficial for construction. If the Contractor determines temporary shoring is necessary, it shall be noted in the shop drawings.
- D. Metal decking shall be installed in lengths as called on the structural drawings. End joints shall occur at points of support only.
- E. Attachment of the metal deck to the steel frame and side lap connections shall be as shown on the structural drawings and as recommended by the manufacturer.
- F. Furnish and install diagonal supports at columns and any other miscellaneous structural supports which are required to carry the metal deck and are not shown on the plans.
- G. Cut and reinforce penetrations of the metal decking with loose angles or tubes for pipes, conduits, ducts, shafts, etc., that are shown on the architectural or structural drawings.

SECTION 053000 – METAL DECKING

- H. All other holes or penetrations of the metal decking required by the various trades shall be cut and the decking reinforced by the subcontractor for the respective trade.
- I. Concrete fill thicknesses shown on the plans are minimum thicknesses. The Contractor shall provide additional concrete fill as required to compensate for framing and deck deflection to maintain surface tolerances and minimal concrete cover.
- J. The Contractor shall protect the metal decking during transport, on site storage, and erection. Any decking which is found to be damaged shall be removed and replaced at the Contractor's expense.
- K. No conduits or utilities shall be placed within the concrete topping unless specifically noted on the structural plans or approved by the engineer.

3.02 PATCHING

- A. Repair abraded areas of the shop-applied coating, areas of weld where the shop-applied coating has been damaged and rust spots on the bottom surfaces of the decking units with a galvanizing repair compound in accordance with the metal decking manufacturer's printed instructions.

3.03 FIELD QUALITY CONTROL

- A. Inspections: The Owner's agent will perform the inspections shown on the contract drawings.

END OF SECTION

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 APPLICABLE SECTION

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this Section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, fabricating, and erecting cold-formed metal framing complete in place, as described in this Section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
 - 1. Furnishing and installing cold-formed metal framing.
 - 2. Furnishing and installing plywood sheathing
- C. Related Work Specified Elsewhere:
 - 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.

1.03 REFERENCE STANDARDS

- A. The following is a list of reference standards referred to in this portion of the specification:
 - 1. ASTM A36, "Specification for Structural Steel."
 - 2. ASTM A653, "Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality."
 - 3. SSPC, "Systems and Specifications, Steel Structures Painting Manual Volume 2" by Steel Structures Painting Council.

SECTION 054000 – COLD-FORMED METAL FRAMING

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State, and Local codes and safety regulations. In addition, the fabrication and erection of cold-formed metal framing shall comply with all the applicable provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. "Specification for the Design of Cold Formed Steel Structural Members" by the American Iron and Steel Institute, current edition.
 - 2. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction, current edition.
 - 3. A.W.S. "Structural Welding Code - Sheet Steel," D 1.3, current edition.
 - 4. A.W.S. "Structural Welding Code - Steel," D 1.1, current edition.
 - 5. American Plywood Association, "U.S. Product Standard PS1-09."
- B. Qualifications: Welding processes and welding operators shall be qualified in accordance with AWS "Standard Qualification Procedure." Welders to be employed are to provide AWS certification for the type of welding necessary.
- C. Grade marks:
 - 1. All plywood shall be identified as to species, grade, and glue type, and shall bear the identification grade mark of the American Plywood Association.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's product information and installation instructions for each item of metal framing and accessories.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect metal framing units from rusting and damage.
- B. Deliver to Project site in manufacturer's unopened containers or bundles, identified with name, brand, type and grade.
- C. Store off ground in a dry ventilated space or protect with suitable waterproof covering.

SECTION 054000 – COLD-FORMED METAL FRAMING

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. American Studco, Inc., Angeles Metal Systems, California Metal Systems, Inc., Consolidated Fabricators Corp., Design Shapes in Steel, Dietrich Industries, Inc., Knorr Steel Framing Systems, Unimast, Inc., United Construction Supply, Western Metal Lath Co. or approved equal.

2.02 MATERIALS

- A. Galvanized-Steel Sheet: ASTM A653, zinc coated in accordance with ASTM A653, G60 coating designation.
 - 1. Grade:
 - a. 18-gauge or lighter: Grade A, 33,000-psi minimum yield strength.
 - b. 16-gauge or heavier: Grade D, 50,000-psi minimum yield strength.

2.03 WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges. Minimum sizes as follows, unless noted otherwise on the drawings:
 - 1. Design Uncoated-Steel Thickness: 18-gauge (43 mil).
 - 2. Flange Width: 1-5/8-inches.
 - 3. Web: Punched.
- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges. Minimum sizes as follows, unless noted otherwise on the drawings:
 - 1. Design Uncoated-Steel Thickness: 18-gauge (43 mil).
 - 2. Flange Width: Manufacturer's standard deep flange.
- C. Top Deflection Track: Superior Metal Iron "SPT 53 Type" or approval equal, galvanized steel gauge recommended by manufacturer for stud with required.

2.04 FLOOR/ROOF FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges. Minimum sizes as follows, unless noted otherwise on the drawings:
 - 1. Design Uncoated-Steel Thickness: 18-gauge (43 mil).
 - 2. Flange Width: 1-5/8-inches minimum.
 - 3. Web: Unpunched.

SECTION 054000 – COLD-FORMED METAL FRAMING

- B. Steel Ledgers: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges. Minimum sizes as follows, unless noted otherwise on the drawings:
 - 1. Design Uncoated-Steel Thickness: 18-gauge (43 mil).
 - 2. Flange Width: Manufacturer's standard deep flange.

2.05 PLYWOOD

- A. General: Plywood shall conform to U.S. Product Standard PS 1-09, American Plywood Association. Each sheet shall be stamped with the PS and/or APA grademark.
- B. Roof Plywood
 - 1. Shall be 5 ply exposure 1, CDX, span rating 32/16, Species Group 2 or better.
 - 2. Shall be 5 ply exposure 1, Structural I span rating 32/16, Species Group 1.
- C. Wall Plywood
 - 1. Shall be 4 ply exposure 1, Structural I, span rating 32/16, Species Group 1.

2.06 FRAMING ACCESSORIES

- A. Fabricate steel framing accessories of the same material and finish used for framing members.

2.07 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Slide Clips: Dietrich "Big D Slide-Clip" or approved equal for attaching metal studs to building structure, gauge indicated or recommended by stud manufacturer.
- C. Sheet Metal Screws (SMS): ASTM C1513, fabricated from corrosion-resistant materials.
- D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure.
- E. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials.
- F. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.

SECTION 054000 – COLD-FORMED METAL FRAMING

- G. Welding Electrodes: Comply with AWS standards.

2.08 PAINT

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94-percent zinc dust by content.

2.09 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
 - 1. Fabricate framing assemblies in jig templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding or screw fastening as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening in accordance with manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.
- C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8-inch in 10 feet.
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finish materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8-inch.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions

SECTION 054000 – COLD-FORMED METAL FRAMING

affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.03 INSTALLATION

- A. Cold-formed metal framing may be shop or field fabricated for installation or it may be field assembled.
- B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
 - 1. Cut framing members by sawing or shearing, do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to manufacturer's instructions with screws penetrating joined members by not less than three exposed screw threads.
- C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- D. Provide temporary bracing and leave in place until framing is permanently stabilized.
- E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- F. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8-inch in 10 feet.
 - 1. Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- G. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at 24 inches on center for powder-driven anchors, 32 inches on center for expansion anchors unless noted otherwise on contract drawings.

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- H. Securely seat studs against webs of top and bottom tracks. Fasten both flanges to studs at top and bottom track. Space studs as indicated.
- I. Set studs plumb, except as required for diagonal bracing for non-plumb walls or warped surfaces.
- J. Align studs vertically where wall framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- K. Anchor studs abutting structural columns or walls to supporting structure.
- L. Install headers over wall openings wider than the stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full height wall studs.
- M. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, furnishings, and similar work requiring attachment to framing.
- N. Install deflection track where studs are attached to building structure to allow for building slab deflection without transmitting forces to metal studs.
- O. Install horizontal bridging in stud system, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.
- P. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall framing system.
- Q. Provide hole reinforcing plate over web penetrations that exceed the size of the stud manufacturer's standard punched openings. Unreinforced penetrations shall be a minimum of 24 inches on center and 10 inches clear from end of stud.
- R. Where welding to create framing assemblies, weld in alternating patterns along length to reduce overheating.
- S. Center joints or plywood accurately over supports and fastened into studs. Protect all plywood from moisture by use of all required waterproof covering until the plywood has in turn been covered by the next succeeding component or finish.

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3.04 FABRICATED WALL PANEL INSTALLATION

- A. Install fabricated wall panels and securely anchor to supporting structure.
- B. Erection Tolerances: Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true to line joints.
 - 1. Maximum variation in plane and true position between prefabricated assemblies shall not exceed 1/16-inch.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repair: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A780.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer to ensure that cold formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Material standards, finishes, and basic fabrication methods for miscellaneous metal materials, including those that are part of other metal systems specified elsewhere.
 2. Metal fasteners used in fastening various portions of the work. Installation of each fastener is specified in section that specifies the work to be fastened.
 3. Architecturally exposed metal fabrications as defined in this Section and as indicated on the Drawings.
 4. Fabricated metal items as scheduled below and as indicated on the Drawings:
 - a. Steel framing and supports for folding and overhead coiling doors.
 - b. Steel framing and supports for countertops.
 - c. Steel supports, accessories and attachments for Aluminum Column Cover.
 - d. Metal stair handrails.
 - e. Guardrail at exterior deck.
 - f. Sliding Metal Screen with siding hardware.
 - g. Mechanical screen metal panels, accessories and attachments.
 - h. Framing and attachment angles for steel gates and site walls incorporating metal panels. Coordinate scope of work with Section 042200, CONCRETE MASONRY UNIT, and Section 323119, FENCES, GATES, AND MOTORIZED OPERATORS.
 - i. Removable steel bollards with top caps. Fabricate removable bollards to receive padlocks.
 - j. Steel framing and supports for mechanical and electrical equipment.
 - k. Miscellaneous steel angles, trim, framing, and supports for applications as indicated on the Drawings and where items are not specified in other Sections.

SECTION 055000 – METAL FABRICATIONS

- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels. Anchor bolts, steel pipe sleeves, and inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Sections include the following:
 - 1. Section 014000, QUALITY REQUIREMENTS, for welding tests and inspections.
 - 2. Section 033000, CAST-IN-PLACE CONCRETE, for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
 - 3. Section 042200, CONCRETE MASONRY UNIT, for loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
 - 4. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for additional structural steel requirements.
 - 5. Section 055015, ACCESS LADDERS, for metal ladder requirements.
 - 6. Section 055100, METAL STAIRS, for metal stair requirements.
 - 7. Section 055800, ARCHITECTURAL METAL COLUMN COVERS, for cover over vertical support at roof canopy.
 - 8. Section 061000, ROUGH CARPENTRY, for framing anchors and other rough hardware and fasteners.
 - 9. Section 075423,
 - 10. Section 076200, SHEET METAL FLASHING AND TRIM, for sheet metal work.
 - 11. Section 077200, ROOF ACCESSORIES, for roof access hatch.
 - 12. Section 099113, EXTERIOR PAINTING, and Section 099123, INTERIOR PAINTING, for field painted primers and final coats.
 - 13. Section 129300, SITE FURNISHINGS, for bicycle racks cast into concrete sidewalks.
 - 14. Section 265600, EXTERIOR LIGHTING, for bollard type site lighting.
 - 15. Section 323119, FENCES, GATES, AND MOTORIZED OPERATORS, for steel attachments and fasteners to adjacent work.

1.03 DEFINITIONS

- A. Architecturally Exposed Structural Steel: Exposed structural steel or miscellaneous metal fabrications that are within 96 inches vertically and 36 inches horizontally of a walking surface and are visible to a person standing on that walking surface shall be designated as "architecturally exposed structural steel" or "AESS".
 - 1. Comply with requirements specified in Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for "architecturally exposed metal fabrications."

SECTION 055000 – METAL FABRICATIONS

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design custom steel gates and angle frames incorporating metal wall panels, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 2. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 REFERENCED STANDARDS

- A. American Institute of Steel Construction:
 - 1. Specification for Structural Steel Buildings. Current Edition.
- B. American Welding Society (AWS):
 - 1. AWS D1.1-06, Structural Welding Code – Steel.
 - 2. AWS D1.2-03, Structural Welding Code – Aluminum.
 - 3. AWS D1.6-99, Structural Welding Code – Stainless Steel.
- C. American Society of Engineers International (ASME):
 - 1. ASME B18.2.1-96, Square and Hex Bolts and Screws Inch Series (Reaffirmed 05).
 - 2. ASME B18.6.1-81, Wood Screws (Inch Series) (Reaffirmed 97).
 - 3. ASME B18.6.3-03, Machine Screws and Machine Screw Nuts.
 - 4. ASME B18.21.1-99, Lock Washers (Inch Series) (Reaffirmed 05).
 - 5. ASME B18.22.1-65, Plain Washers (Reaffirmed 03).
- D. American Society for Testing and Materials International (ASTM):
 - 1. ASTM A27-05, Specification for Steel Castings, Carbon, for General Application.
 - 2. ASTM A36-05, Specification for Carbon Structural Steel.
 - 3. ASTM A47-99, Specification for Ferritic Malleable Iron Castings (Reapproved 04).
 - 4. ASTM A48-03, Specification for Gray Iron Castings.
 - 5. ASTM A53-06a, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 6. ASTM A123-02, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

SECTION 055000 – METAL FABRICATIONS

7. ASTM A153-05, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
8. ASTM A240-06, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
9. ASTM A276-06, Specification for Stainless Steel Bars and Shapes.
10. ASTM A283-03, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
11. ASTM A307-04, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
12. ASTM A325-06, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
13. ASTM A489-04, Specification for Carbon Steel Lifting Eyes.
14. ASTM A500-03a, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
15. ASTM A563-04a, Specification for Carbon and Alloy Steel Nuts.
16. ASTM A653-06, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
17. ASTM A666-03, Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
18. ASTM A780-01, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
19. ASTM A786-05, Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
20. ASTM A793-96, Specification for Rolled Floor Plate, Stainless Steel (Reapproved 01).
21. ASTM A1008-06a, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
22. ASTM B26-05, Specification for Aluminum-Alloy Sand Castings.
23. ASTM B209-06, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
24. ASTM B221-05a, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
25. ASTM B632-02, Specification for Aluminum-Alloy Rolled Tread Plate.
26. ASTM B633-98, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
27. ASTM C1107-05, Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
28. ASTM D1187-97, Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal (Reapproved 02).
29. ASTM E119-05a, Test Methods for Fire Tests of Building Construction and Materials.
30. ASTM E488-96, Test Methods for Strength of Anchors in Concrete and Masonry Elements (Reapproved 03).

SECTION 055000 – METAL FABRICATIONS

31. ASTM F593-02, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
32. ASTM F594-02, Specification for Stainless Steel Nuts.
33. ASTM F1554-04, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
34. ASTM F1941-00, Specification for Electrodeposited Coatings on Threaded Fasteners [Unified Inch Screw Threads (UN/UNR)] (Reapproved 06).
35. ASTM F2329-05, Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

E. International Code Council ICC/CBC:

1. California Building Code, 2019.

F. Master Painters Institute:

1. MPI#20-02, Epoxy Zinc-Rich Primer.
2. MPI#79-04, Alkyd Anti-Corrosive Metal Primer.

G. Metal Framing Manufacturers Association:

1. MFMA-4-04, Metal Framing Standards Publication.

H. National Association of Architectural Metal Manufacturers

1. Metal Finishes Manual for Architectural and Metal Products, Current Edition.

I. SSPC: The Society for Protective Coatings:

1. SSPC-PA 1-00, Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel (Revised 04).
2. SSPC-Paint 20-02, Paint Specification No. 20: Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") (Revised 04).
3. SSPC-SP 3-04, Surface Preparation Specification No. 3: Power Tool Cleaning.
4. SSPC-SP 6/NACE No. 3-00, Joint Surface Preparation Std. SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning (Revised 04).

1.06 SUBMITTALS

A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.

B. Product Data: For the following:

1. Mechanical Screen Panels.
2. Paint products.
3. Grout.

SECTION 055000 – METAL FABRICATIONS

- C. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: Indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
- D. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Welding Certificates.
- G. Qualification Data: For professional engineer.

1.07 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, Structural Welding Code – Steel.
 - 2. AWS D1.2, Structural Welding Code – Aluminum.
 - 3. AWS D1.3, Structural Welding Code – Sheet Steel.
 - 4. AWS D1.6, Structural Welding Code – Stainless Steel.

1.08 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1.09 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
 - 2. Deliver such items to Project site in time for installation.

SECTION 055000 – METAL FABRICATIONS

- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described in PART 2 below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.

2.02 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.03 FERROUS METALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A36.
- C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.
- E. Steel Tubing: ASTM A500, cold-formed steel tubing.
- F. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

SECTION 055000 – METAL FABRICATIONS

- G. Slotted Channel Framing:
 - 1. Cold-formed metal channels with continuous slot complying with MFMA-3.
 - 2. Size of Channels: Minimum 1-5/8 inches by 1-5/8 inches, and as indicated on the Drawings.
 - 3. Material: Galvanized steel complying with ASTM A653, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.
 - 4. Material: Steel complying with ASTM A1008, commercial steel, Type B; 0.0677-inch minimum thickness; hot-dip galvanized after fabrication.

2.04 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B26, Alloy 443.0-F.

2.05 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1.
- D. Anchor Bolts: ASTM F1554, Grade 36; provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A489.
- F. Machine Screws: ASME B18.6.3.
- G. Lag Bolts: ASME B18.2.1.
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, ASME B18.22.1.

SECTION 055000 – METAL FABRICATIONS

- J. Lock Washers: Helical, spring type, ASME B18.21.1.
- K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153.
- L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.

2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 09 painting sections.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete Materials and Properties: Comply with requirements in Section 033000, CAST-IN-PLACE CONCRETE, for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000-psi, unless otherwise indicated.

SECTION 055000 – METAL FABRICATIONS

2.07 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8-inch by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

SECTION 055000 – METAL FABRICATIONS

2.08 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts if units are installed after concrete is placed.
- C. Fabricate steel girders for metal frame construction from continuous steel shapes of sizes indicated.
 - 1. Provide bearing plates welded to beams where indicated.
 - 2. Drill girders and plates for field-bolted connections where indicated.
 - 3. Where metal screws are attached to girders with bolts or lag screws, drill holes at 24 inches o.c.
- D. Fabricate steel pipe columns for supporting metal frame construction from steel pipe with steel baseplates and top plates as indicated. Drill baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness, unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- E. Galvanize miscellaneous framing and supports where indicated.

2.09 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.10 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts,

SECTION 055000 – METAL FABRICATIONS

spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates after fabrication.

2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.13 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.14 MECHANICAL SCREEN PANELS AT MECHANICAL ENCLOSURE

- A. Acceptable Supplier:
1. Bok Modern Inc., San Francisco, CA 94109, Phone: (415) 749-6500, Email: info@bokmodern.com, Website: www.bokmodern.com.
 2. Or approved equal.

SECTION 055000 – METAL FABRICATIONS

- B. Ornamental Perforated Metal Panels
 - 1. Fence Panel: 4 Bend Panel – 4 feet W x 4 feet H.
 - 2. Perforated Aluminum Sheet: 1/8-inch TH.
 - 3. BOK Pattern Library Style B21.
 - 4. Finish: Color Anodic Finish: AAMA 611, AA-M12C22A44, MIL-A-8625F Type II, Architectural Class 1, 0.7 to 1.2 mil coating thickness.
 - 5. Color: Dark Bronzed.

2.15 STAINLESS STEEL COUNTERTOPS AND BACKSPLASH:

- A. Provide 1/4-inch metal countertop with joints continuously welded at interior and exterior corners.
- B. Place metal countertop over Marine Grade plywood, minimum 3/4-inch thick.
- C. Back Splash:
 - 1. Height: 6 inches.
 - 2. Top Edge: Return to wall.
- D. Front Edge Treatment: Square Edge, turned down 2 inches.
- E. Smooth exposed edges.

2.16 CAST-IN-PLACE STAIR AND LANDING NOSINGS

- A. Acceptable Supplier:
 - 1. Wooster Products, Inc.
 - 2. Or approved equal.
- B. Cast-in-Place Nosings:
 - 1. Provide Supergrit® type 231BF safety nosings.
 - 2. Tread base shall be type 6063-T5 extruded aluminum.
 - 3. Anti-slip filler shall contain not less than 65 percent virgin grain Aluminum Oxide (Al₂O₃) abrasive.
 - 4. Black insert at top and bottom of each run and landing. Gray insert at intermediate treads.
 - 5. ADA Compliant Nosing across all treads and landings.
 - 6. Nosings shall finish flush with the top of the traffic surface.

2.17 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

SECTION 055000 – METAL FABRICATIONS

2.18 STEEL AND IRON FINISHES

- A. Galvanizing: Galvanize metal fabrications exposed to the exterior and galvanize interior metal fabrications where indicated, to comply with applicable standard listed below:
 - 1. ASTM A123, for galvanizing steel and iron products.
 - 2. ASTM A153, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Interiors (SSPC Zone 1A): SSPC-SP 3, Power Tool Cleaning.
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel, for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.19 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish (where indicated): AA-M12C22A41 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

SECTION 055000 – METAL FABRICATIONS

- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

SECTION 055000 – METAL FABRICATIONS

3.03 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 METAL BOLLARD INSTALLATION

- A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- B. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.
- C. Fill bollards solidly with concrete where indicated, mounding top surface to shed water.

3.05 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

SECTION 055015
ACCESS LADDERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SECTION INCLUDES

- A. Aluminum access ladders.

1.03 RELATED SECTIONS

- A. Section 055000, METAL FABRICATIONS: Fasteners and installation requirements used to attach ladders to structure.
- B. Section 077200, ROOF ACCESSORIES: for roof access hatch and fall protection accessories.
- C. Section 142100, ELECTRIC TRACTION ELEVATORS, for pit ladders.
- D. Division 26, Electrical, for electrical grounding of ladders.

1.04 REFERENCES

- A. AA, Aluminum Association.
- B. ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. OSHA 1910.27, Fixed Ladders.

SECTION 055015 – ACCESS LADDERS

1.05 SUBMITTALS

- A. Submit under provisions of Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's data sheets on each product.
- C. Shop Drawings:
 - 1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. Provide reaction loads for each hanger and bracket.
- D. Qualification Data:
 - 1. Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications, and resources.
- E. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors.
- F. Verification Samples: For each finish specified, two samples, minimum size 6 inches (150 mm) square, represent actual product color.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
 - 1. Record of successful in-service performance.
 - 2. Sufficient production capacity to produce required units.
 - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
- C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

SECTION 055015 – ACCESS LADDERS

1.08 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurement before fabrication.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

1.09 WARRANTY

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third-party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.
- B. Manufacturer shall be notified immediately of defective products and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

1.10 EXTRA MATERIALS

- A. Furnish touchup kit for each type and color of paint finish provided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: O’Keeffe’s, Inc.; 100 N Hill Drive, Suite 12, Brisbane, CA 94005. Toll Free Telephone: (888) 653-3333, Telephone: (415) 824-4900. Fax: (415) 824-5900.
- B. Or approved equal.

SECTION 055015 – ACCESS LADDERS

2.02 APPLICATIONS/SCOPE

- A. Fixed Access Ladder:
 - 1. Standard Duty Channel Rail.
 - a. Model 500 as manufactured by O’Keeffe’s Inc.
 - b. Wall-braced bottom bracket.
 - c. Extension Wall Bracket where required.

2.03 FINISHES

- A. Paint. Urethane over chemically pretreated substrate.
 - 1. Fire Red (RAL 2002).

2.04 MATERIALS

- A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
- B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

2.05 FABRICATION

- A. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18–3/8 inches (467 mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
 - 1. Rungs shall withstand a 1,500-pound (454 kg) load without deformation or failure.
- B. Channel Side Rails: Not less than 1/8-inch (3 mm) wall thickness by 3 inches (76 mm) wide.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.
- B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.
- C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

SECTION 055015 – ACCESS LADDERS

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 055100

METAL STAIRS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section specifies steel stairs with concrete filled pan treads
- B. Section 055000, METAL FABRICATIONS, for steel handrails.
- C. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for structural support system and structural drawings
- D. Designated Design Documentation, for treads, risers and attachment to stringers, concrete slab and landings..

1.02 RELATED WORK

- A. Section 033000, CAST-IN PLACE CONCRETE, for support footings.
- B. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for stair structural systems.
- C. Section 055000, METAL FABRICATIONS, for hand rails and guardrail material, stair nosing and landing inlays.
- D. Section 096623, EPOXY TERRAZZO FLOORING, for terrazzo landings.
- E. Section 099113, EXTERIOR PAINTING, and Section 099123, INTERIOR PAINTING, for requirements for shop and field painting.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For the following:
 - 1. Paint products.
 - 2. Stair components.

- C. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: Indicating percentages by weight of postconsumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
- D. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal stair and their connections. Show support posts and building connections.
 - 2. Show anchorage and accessory items.
 - 3. Provide templates for anchors and bolts specified for installation under other Sections.
 - 4. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Welding certificates.
- G. Qualification Data: For professional engineer.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, Structural Welding Code – Steel.
 - 2. AWS D1.2, Structural Welding Code – Aluminum.
 - 3. AWS D1.3, Structural Welding Code – Sheet Steel.
 - 4. AWS D1.6, Structural Welding Code – Stainless Steel.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with steel stair fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1.06 COORDINATION

- A. Coordinate installation of stairs with stringer installation.
- B. Furnish setting drawings, templates, and directions for installing stairs that are to be embedded in concrete or masonry.

- C. Deliver such items to project site in time for installation.
- D. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section.

1.07 APPLICATION PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A36/A36M-04, Structural Steel.
 - b. ASTM A47-99 (R2004), Ferritic Malleable Iron Castings.
 - c. ASTM A48-03, Gray Iron Castings.
 - d. ASTM A53-04, Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.
 - e. ASTM A307-04, Carbon Steel Bolts and Studs, 60000 psi Tensile Strength.
 - f. ASTM A653/653M-04, Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process.
 - g. ASTM A563-04, Carbon and Alloy Steel Nuts.
 - h. ASTM A1008-04, Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy.
 - i. ASTM A786/A786M-00, Rolled Steel Floor Plates.
 - j. ASTM A1011-04, Steel, Sheet and Strip, Strip, Hot-Rolled Carbon, Structural, High-Strength, Low-Alloy.
 - 2. American Welding Society (AWS):
 - a. AWS D1.1-00, Structural Welding Code-Steel.
 - b. AWS D1.3-98, Structural Welding Code-Sheet Steel.
 - 3. The National Association of Architectural Metal Manufacturers (NAAMM) Manuals:
 - a. Stair Manual.
 - b. Current Edition – Pipe Railing Manual, Including Round Tube.
 - 4. American Iron and Steel Institute (AISI):
 - a. Specification for the Design of Cold-Formed Steel Structural Members.

PART 2 - PRODUCTS

2.01 DESIGN CRITERIA

- A. Design stairs to support a live load of 100 lbs per square foot.
- B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.

2.02 MATERIALS

- A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.
- B. Sheet Steel: ASTM A1008.
- C. Structural Steel: ASTM A36.
- D. Steel Floor Plate: ASTM 786.
- E. Steel Plate: ASTM A1011.
- F. Iron Castings: ASTM A48, Class 30.
- G. Malleable Iron Castings: ASTM A47.

2.03 FABRICATION GENERAL

- A. Fasteners:
 - 1. Conceal bolts and screws wherever possible.
 - 2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.
 - 3. Provide connections to slab and landings.
- B. Welding:
 - 1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.
 - 2. Where possible, locate welds on unexposed side.
 - 3. Grind exposed welds smooth and true to contour of welded member.
 - 4. Remove welding splatter.
- C. Remove sharp edges and burrs.
- D. Fit stringers to head channel and close ends with steel plates welded in place where shown.
- E. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 099113, EXTERIOR PAINTING, and Section 099123, INTERIOR PAINTING.

2.04 INTERIOR CLOSED RISER STAIRS

- A. Provide risers and pan treads and other supporting members.
- B. Fabricate risers from sheet steel.
- C. Fabricate stringers, headers, and other supporting members from structural steel.

2.05 TERRAZZO LANDING COORDINATION:

- A. Coordinate the installation of the terrazzo landings with the design of the steel stair system.
- B. Support treads and risers by use of carrier angles welded to stringers.
- C. Coordinate installation of concrete in metal pan at stair landing and then with terrazzo overlay to ensure the proper rise at each landing.

PART 3 - EXECUTION

3.01 STAIR INSTALLATION

- A. Provide hangers and struts required to support the loads imposed.
- B. Perform job site welding and bolting as specified for shop fabrication.
- C. Set stairs and other members in position and secure to structure as shown.
- D. Install stairs plumb, level and true to line.
- E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.
- F. Coordinate installation of related trades during construction.

3.02 FIELD PRIME PAINTING

- A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.
- B. Touch-up abraded areas with same primer paint used for shop priming.
- C. Touch up abraded galvanized areas with zinc rich paint as specified in Section 099113, EXTERIOR PAINTING, and Section 099123, INTERIOR PAINTING,

END OF SECTION

SECTION 055800

ARCHITECTURAL METAL COLUMN COVERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Work of this section includes materials, accessories and related items for the complete installation of column covers.
- C. Related work specified elsewhere includes internal post structure for solid support of column covers.

1.02 SUBMITTALS

- A. Submit complete shop drawings indicating quantities, finishes, dimensions, and attachment relationships.
- B. Submit manufacturers product data, specifications and installation instructions.
- C. Submit color and finish samples to determine range of texture and consistency of color and finish to be expected in the finished work. Standard sample size shall be 3 inches x 3 inches.

1.03 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 5 years' experience in manufacturing architectural metals.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in clearly marked containers and packages suitable for shipment of specified products so as to prevent finish damage in transit. Provide protective wrapping or film to provide protection.
- B. Store components in locations that will avoid damage from job-site traffic, moisture, stacking or other job-site contamination.

SECTION 055800 – ARCHITECTURAL METAL COLUMN COVERS

- C. Handle components to avoid racking, twisting, denting or scratching of finished surfaces.

1.05 WARRANTY

- A. Provide manufacturer's warranty against defects in material and workmanship for a period of 1 year beginning on Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Fry Reglet Corporation, 1377 Stonefield Court, Alpharetta, GA 30004, Phone: (800) 955-2343, Fax: (800) 200-4379.
- B. Or approved equal.

2.02 PRODUCTS

- A. Series E - Economical Butt Joint:
 - 1. Aluminum sheet and plate: Type 3003-H14, 5005-H34 (anodized) or 5052-H32 alloy complying with ASTM B209.
 - a. Thickness: 0.125-inch.
 - b. Finish: Kynar 500 Paint. Finish shall meet or exceed AAMA 2605 "Voluntary Specification for High Performance Organic Coasting on Architectural Extrusion Panels." Nominal dry film thickness shall be 0.30 mil for primer and 1.0 mil for finish coats.
 - c. Color: Dark Bronze.
 - 2. Formed Steel Posts: Formed steel posts to be provide by the manufacturer. Supporting structural support specified in other sections.
- B. Manufactured Units:
 - 1. Configuration: Round.
 - 2. Diameter: 18 inches.
 - 3. Joint type: Vertical: LED Reveal
 - 4. Horizontal:
 - a. Through soffit
 - b. Intermediate at 12 feet o.c.: Butt joint with factory supplied alignment plates.
 - 5. Floor: Flush to concrete base.
 - 6. Trim: Provide aluminum molding, column color, to receive exterior soffit material. Color to match column.

SECTION 055800 – ARCHITECTURAL METAL COLUMN COVERS

- C. Fabrication:
 - 1. Column covers shall be self-aligning with attachment clips at 18 inches o.c. to assure solid attachment to post structures.
 - 2. Form radii to achieve true and smooth curves as indicated.
 - 3. Provide column covers in sections a maximum 12 feet tall per section. Provide additional sections to achieve finished heights above 12 feet.
 - 4. Columns shall have no exposed fasteners.
 - 5. Provide additional bracing components as necessary to stiffen substructure and insure solid mid-span bracings and connections.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine job-site conditions for conditions that may adversely affect installation of column covers.
- B. Verify dimensions of column covers prior to installation to assure compatibility with job-site conditions.
- C. Verify post structure is plumb, level, and parallel prior to installation of column covers.
- D. Visually examine finished surfaces to assure that blemished or dented surfaces are not present prior to installation.

3.02 PREPARATION

- A. Verify/coordinate with other trades prior to installation insofar as they are affected by column cover installation.

3.03 INSTALLATION

- A. Install components in accord with manufacturer's installation instructions and approved shop drawings.
- B. Anchor components to related structures such as floors, walls and beams as indicated on approved shop drawings. Use anchors with holding strength to provide a solid installation. Use only galvanized or stainless steel anchors.

3.04 CLEANING

- A. Remove protective coverings and clean column covers to remove adhesives and tape residue. Test all solvents on non-exposed surfaces prior to use.

SECTION 055800 – ARCHITECTURAL METAL COLUMN COVERS

1. For painted surfaces, use a mild detergent solution on a soft cloth.
 2. For stainless steel, use a glass cleaner and a soft cloth.
 3. For other surfaces, contact manufacturer for proper cleaning procedures.
- B. Visually inspect all exposed surfaces for scratches or blemishes.
- C. Protect column covers from damage during remainder of construction period.

END OF SECTION

DIVISION 06
WOOD AND PLASTICS

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 APPLICABLE SECTIONS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation and facilities and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing rough carpentry, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom.
- B. Work Included:
1. Furnishing and installing wood framing, blocking and sheathing.
 2. Furnishing and installing plywood sheathing.
 3. Furnishing and installing light gage metal connectors.
 4. Furnishing and installing bolts, lag screws, washers, spikes and nails necessary for connecting wood framing and sheathing.
 5. Installing miscellaneous metal connectors.
 6. Temporary Bracing.
- C. Related Work Specified Elsewhere:
1. Section 031000, CONCRETE FORMWORK.
 2. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.

1.03 REFERENCE STANDARDS

- A. The following is a list of reference standards referred to in this portion of the specifications.
1. ASTM A307, Specification for Carbon Steel Externally Threaded Standard Fasteners.
 2. WCLIB, Standard Grading and Dressing Rules No. 17.
 3. Federal Specification FF-N-105B with Interim Amendment 4.

SECTION 061000 – ROUGH CARPENTRY

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. California Building Code, current governing edition.
 - 2. National Forest Products Association, "National Design Specification for Wood Construction," current edition.
 - 3. American Plywood Association, "U.S. Product Standard PS1-09."
 - 4. American Institute of Timber Construction, American National Standard ANSI/AITC A190.1-2012 for Wood Products-Structural Glued Laminated Timber."
- B. Grade marks:
 - 1. All framing lumber shall be identified by the grade stamp of the West Coast Lumber Inspection Bureau.
 - 2. All plywood shall be identified as to species, grade, and glue type, and shall bear the identification grade mark of the American Plywood Association.
- C. Testing and Inspection:
 - 1. The Owner shall employ an independent testing laboratory or the Engineer as the Owner's agent to perform the inspections and tests shown on the contract drawings and submit certified test results. The Contractor will cooperate with and notify Owner's agent at least 24 hours in advance of inspections required:

1.05 SUBMITTALS

- A. General Requirements
 - 1. Submittals shall be made to Architect in accordance with the requirements of Division 01, GENERAL REQUIREMENTS, of these specifications.
 - 2. Construction of wood framing and sheathing shall not begin until Contractor has received submittals reviewed by Architect governing all aspects of the intended work.
- B. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following materials:
 - 1. Light gage metal connectors.

1.06 SEQUENCING AND SCHEDULING

- A. Obtain information and instructions from other trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be installed prior to or in conjunction with rough carpentry so provision for their work can be made without delaying the project.

SECTION 061000 – ROUGH CARPENTRY

- B. Do any cutting and repairing made necessary by failure or delay in complying with these requirements, at no cost to Owner.

PART 2 - PRODUCTS

2.01 FRAMING

- A. General: Framing shall be Douglas Fir Coast Region, conforming to West Coast Lumber Inspection Bureau Standard Grading and Dressing Rule No. 17, as amended to date.
 - 1. 2x, 3x, 4x, plates, joists, purlins and beams, No. 1 and better (1200F-b), Para. 123-b, unless noted otherwise on the drawings.
 - 2. 2x, 3x, 4x, joists, purlins and beams, Select Structural (1500F-b), 123-a, where noted on the drawings.
 - 3. 6x beams, Dense No. 1 (1550F-b). Para 130-bb.
 - 4. 2x, 3x, 4x ledgers, No. 1 (1000F-b), Para. 123-b, unless noted otherwise on the drawings.
 - 5. 4x4 posts, No. 1 (1500F-c), Para. 124-b, unless noted otherwise on the drawings.
 - 6. 4x6 posts, No. 1 (1500F-c), Para. 123-b, unless noted otherwise on the drawings.
 - 7. 6x6 and larger posts, Dense No. 1, (1200F-c), Para. 131-bb.
 - 8. 2x, 3x studs and blocking, No. 1 (1000F-b), Para. 123-b.
 - 9. Foundation plates: Pressure treated Douglas Fir No. 1.
- B. All framing lumber 6 inches or larger in the least dimension shall be FOHC.

2.02 PLYWOOD

- A. General: Plywood shall conform to U.S. Product Standard PS 1-09, American Plywood Association. Each sheet shall be stamped with the PS and/or APA grademark.
- B. Roof Plywood
 - 1. Shall be 5 ply exposure 1, CDX, span rating 32/16, Species Group 2 or better.
 - 2. Shall be 5 ply exposure 1, Structural I span rating 32/16, Species Group 1.
- C. Wall Plywood
 - 1. Shall be exterior type, T1-11 A-C span rating 16 o.c. Species Group 1 with grooves at 8 inches o.c.
 - 2. Shall be 3 ply exposure 1, CDX, span rating 24/0, Species Group 2 or better.
 - 3. Shall be 4 ply exposure 1, Structural I, span rating 32/16, Species Group 1.

SECTION 061000 – ROUGH CARPENTRY

2.03 LIGHT GAGE METAL CONNECTIONS

- A. Light gage metal connectors shall be Simpson Company Strong Tie Connectors, or equal unless noted otherwise on the drawings.

2.04 NAILS

- A. Nails shall be bright common wire nails, galvanized for exterior work and conform to Federal Specification FF-N-105B.
- B. Nailing shall conform to CBC Table 2304.10.1 unless otherwise noted.
- C. Nails in pressure treated lumber shall be hot dipped galvanized steel in compliance with ASTM A153.

2.05 SCREWS

- A. Lag screws shall conform to ANSI/ASME Standard B18.2.1.
- B. Wood screws shall conform to ANSI/ASME Standard B18.6.1.

2.06 BOLTS

- A. Bolts shall conform to ASTM A307, manufactured to American Standard Bolt and Nut dimensions with "Free Fit – Class 2" threads.
- B. Bolts in pressure treated lumber shall be hot dipped galvanized steel in compliance with ASTM A153.

2.07 PRESERVATIVE TREATMENT FOR WOOD

- A. Preservative Treatment for Wood: Water-borne, non-arsenic, non-chromium type complying with AWPA Standard U1. Preservative treatment shall not contain pentachlorophenol, arsenic compounds, or creosote. In addition, the preservative treatment shall comply with the following:
 - 1. Material: Paintable.
 - 2. Comply with CARB limit on VOCs of 350 g/L using EPA Test Method 24.
 - 3. Moisture Content: After treatment, re-dry wood to be used in enclosed locations to a moisture content of 19 percent or less.
 - 4. Retreat all field cut ends and surfaces.

SECTION 061000 – ROUGH CARPENTRY

2.08 FIRE-RETARDANT-TREATED WOOD

- A. Fire Retardant Treatment: Waterborne chemical treatment to comply with AWPA Standard P-5, achieve a flame spread index of 25 or less when tested in accordance with ASTM E84, and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10-1/2 feet beyond the centerline of the burners at any time during the test. Use of ammonium phosphates is prohibited.
- B. Apply in compliance with the applicable AWPA Standard for type of wood and application.
- C. Provide fire retardant treatment for all wood noted on the Drawings to receive it.
- D. Where treated items are indicated on the Drawings to receive a transparent or opaque paint finish, use a fire-retardant treatment which will not bleed through or adversely affect the bond of the finish material.
- E. Structural performance of fire-retardant wood shall meet requirements of ASTM D5664 for lumber and ASTM D5516/D6305 for plywood.
- F. Provide labeling in conformance with CBC Section 2303.2.4 on all fire treated material delivered to the job site.
- G. Acceptable manufactures and products:
 - 1. Koppers Performance Chemicals FirePRO.
 - 2. Hoover Treated Wood Products, Inc. Pyro-Guard.
 - 3. Hoover Treated Wood Products, Inc. Exterior Fire-X.
 - 4. Approved equal.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. All framing operations shall conform to the requirements of the California Building Code.
- B. Set horizontal and sloped members with crown up. Do not notch, bore or cut members for pipes, ducts, conduits, or other reasons except as shown on the drawings or as specifically approved by the Architect/Engineer. Make all bearings full and all blocking solid unless otherwise indicated on the drawings. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

SECTION 061000 – ROUGH CARPENTRY

- C. Joists shall be set with the crowning edge up except at cantilevers.
- D. Solid blocking shall be placed at ends of spans and over supports. Cross-Bridging or solid blocking in spans shall not exceed 8 feet or less if shown on structural drawings.
- E. Furnish and set all columns and studs to size, centers, and locations indicated on the drawings. Unless marked otherwise, studs for furring and partitions shall be 2 x 4 or 2 x 6, set 16 inches o.c. plates on concrete floors shall not be set until the concrete is finished. Cripples shall be run to the floor plates.
- F. Remove all wood, including form lumber, scrap lumber, shavings and sawdust in contact with ground. Leave no wood buried in any fill or backfill.
- G. Furring and blocking shall be furnished and installed where required for reception of wallboard, formation or architectural features, concealment of pipes, conduits, ducts, attachment of supports for towel holders, toilet paper holders, and other fixtures. Contractor shall consult with the trades concerned and set furring and blocking they require.
- H. Fire Blocking shall be installed as shown on drawings and in accordance with the applicable Building Code.
- I. Framing of openings through walls, floors, attics, and roofs shall be provided for roof vents, mechanical equipment, lighting fixtures, ducts, etc. Where one or more joists are cut, the joists supporting the trimmers shall be framed in accordance with the drawings or if not detailed shall be doubled and well spiked. Where continuation of three or more joists is interrupted, the abutting headers and joists shall be reinforced with approved type of joists hangers.
- J. Center joints or plywood accurately over supports and nail into solid wood. Protect all plywood from moisture by use of all required waterproof covering until the plywood has in turn been covered by the next succeeding component or finish.
- K. Lumber not grade stamped, and lumber of improper grade, shall be removed from the job site and immediately replaced by grade stamped lumber of the proper grade.
- L. Other Materials: All other lumber materials, not specifically described but required for the proper completion of the work, shall be new, first quality of their respective kinds and subject to the approval of the Architect/Engineer.
- M. Where the plans do not require solid blocking or a tongue and groove connection at edges of plywood or OSB sheathing, the sheathing edges shall be supported with ply clips or ply cleats.

SECTION 061000 – ROUGH CARPENTRY

3.02 EXAMINATION

- A. Surface Conditions: Prior to the work of this section, carefully inspect the installed work of other trades and verify that all such work has been so installed as to allow rough carpentry to produce surfaces to the required design.

3.03 WORKMANSHIP

- A. All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the drawings and with all pertinent regulations.
- B. Cut all wood members to fit. Do not shim.
- C. Erect all members straight, plumb and accurately located.
- D. Carefully select all structural members. Select individual pieces so that knots and obvious defects will not interfere with making proper connections. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, or crook, or for mildew, fungus or mold as well as for improper cutting or fitting. Cut out and discard all defects which render a piece unable to serve its intended function.

3.04 INSTALLATION

- A. Plates: Plates for partitions and walls shall be single at bottom and double at top. Splices in top plates shall be staggered not less than 48 inches. Where plates are cut for passing pipes and similar items, they shall be reinforced on both sides with 1/8-inch x 3 inches x 18-inch steel plates punched for 10d nails 6 inches o.c., staggered.
- B. Power Driven Inserts: Wherever furring of any kind is attached to concrete or masonry, including lower plates to floors, the members shall be secured with 1/4-inch power driven inserts. Plates anchored to concrete floors shall be attached with pins not over 3 feet o.c. All studs on vertical furring shall be attached with pins not over 4 feet o.c. Each insert shall penetrate the concrete to a minimum of 1-1/2 inches. Use washers with all inserts.

3.05 ERECTION

- A. The Contractor will be responsible to erect the wood framing true to line and grade.

SECTION 061000 – ROUGH CARPENTRY

- B. Temporary Bracing and Shoring:
 - 1. The Contractor shall temporarily brace the wood framing in both directions and shall maintain walls, joists, beams, and other framing members plumb until the final connections of the framework and construction of diaphragms are complete.
 - 2. The Contractor shall provide such temporary shoring and additional bracing of wood framing as required to adequately and safely support any or all loads imposed upon the structure during construction.

3.06 CLEAN UP

- A. In addition to the requirements of General Conditions, keep premises clean and clear of debris caused from this portion of the work. Failure to perform clean up within 24 hours notice by the Architect or General Contractor shall be considered adequate grounds for having the work done by others at this subcontractor's expense.

3.07 FIELD QUALITY CONTROL

- A. Inspections: The Owner's agent will perform the inspections as shown on the contract drawings.

END OF SECTION

SECTION 064023

INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The work of this Section consists of furnishing all transportation, labor, materials, incidentals, and equipment necessary for the construction and installation of all architectural casework and countertops.

1.02 SUMMARY

- A. Section Includes:
1. Shop finished architectural casework constructed of prefinished solid composite panels and shelving.
 2. Shop finished lockers constructed of veneer plywood.
 3. Countertops and backsplashes as follows:
 - a. Type 1: Solid-surfacing-material.
 - b. Type 2: Solid-surfacing-material with integral sinks.
 - c. Type 3: Stainless steel with and without integral sinks.
 4. Solid-surfacing cladding at shower walls and ceilings over fiber-cement backer board.
 5. Solid surface recessed shower shelving unit.
 6. Cabinet hardware and miscellaneous millwork accessories.
 7. Miscellaneous stain grade solid stock and plywood for exposed interior finish carpentry work.
 8. Provide colors and finishes as scheduled at the end of PART 3 and as indicated on the Drawings.
- B. Related Sections:
1. Section 051200, STRUCTURAL METAL FRAMING, for blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 2. Section 055000, METAL FABRICATIONS, for material standards, finishes, and basic fabrication methods for miscellaneous metal materials.
 3. Section 079200, JOINT SEALANTS, for general building joint sealants.
 4. Section 087100, DOOR HARDWARE, for general door hardware and accessories.
 5. Section 093000, GYPSUM BOARD, for installation of fiber-cement backer board at showers to receive solid-surfacing cladding.
 6. Section 102600, WALL PROTECTION PANELS, for vinyl/acrylic wall cladding panels.

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7. Section 102800, TOILET ACCESSORIES, for installation of toilet accessories.
8. Section 220000, PLUMBING, for installation of plumbing connections and accessories for integral sinks and prefabricated shower pans.

1.03 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.04 REFERENCED STANDARDS

- A. American National Standards Institute:
 1. ANSI A208.2-02, Medium Density Fiberboard (MDF) for Interior Applications.
- B. ASTM International:
 1. ASTM D523-89 (Reapproved 1999), Test Method for Specular Gloss.
 2. ASTM D2559-00, Specification for Adhesives for Structural Laminated Wood Products for Use under Exterior (Wet Use) Exposure Conditions.
 3. ASTM D5456-01a, Specification for Evaluation of Structural Composite Lumber Products.
 4. ASTM E84-01, Test Method for Surface Burning Characteristics of Building Materials.
- C. Builders Hardware Manufacturers Association:
 1. BHMA A156.9-03, Cabinet Hardware.
 2. BHMA A156.11-99, Cabinet Locks.
 3. BHMA A156.18-00, Materials and Finishes.
- D. Code of Federal Regulations:
 1. 40 CFR, Part 59, Subpart D-01, National Volatile Organic Compound Emission Standards for Architectural Coatings.
- E. Forest Stewardship Council:
 1. FSC 1.2-00, Principles and Criteria.
- F. International Solid Surface Fabricators Association:
 1. ISSFA-2-01, Classification and Standards Publication of Solid Surfacing Material.
- G. U.S. Department of Commerce, National Institute of Standards and Technology:
 1. DOC PS 1-95, U.S. Product Standard for Construction and Industrial Plywood.

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- H. Woodwork Institute (formerly Woodwork Institute of California):
1. Manual of Millwork, Current Edition.

1.05 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For panel products, adhesive for bonding solid-surfacing materials, cabinet hardware and accessories, and finishing materials and processes.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 2. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural casework.
 3. Apply WI-certified compliance label to first page of Shop Drawings.
- D. Samples:
1. Prefinished solid composite panels.
 2. Solid-surfacing materials including non-drip edge.
 3. Stainless steel for sinks and countertops including marine edge.
- E. LEED Submittals:
1. Product Data for Credit EQ 4.1:
 - a. For installation adhesives, including printed statement of VOC content.
 2. Product Data for Credit EQ 4.4:
 - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
 - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
 3. Product Data for Credit(s) MR 4.1 and MR 4.2:
 - a. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content
 4. Certificates for Credit MR 7:
 - a. Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 5. Include statement indicating costs for each certified wood product.
- F. Product Certificates: For each type of product, signed by product manufacturer.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

- G. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.
- H. Qualification Data: For Installer and fabricator.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Fabricator of products Licensee of WI's Certified Compliance Program.
- C. Quality Standard: Comply with WI's "Manual of Millwork" Premium Grade for interior architectural casework including construction, finishes, installation, and other requirements.
 - 1. Provide WI-certified compliance labels and certificates indicating that casework, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.
- D. Forest Certification: Provide interior architectural casework produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver casework until painting and similar operations that could damage casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
 - 1. Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 to 90 deg F and relative humidity between 25 to 55 percent during remainder the of construction period.
- B. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.
 - 1. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 2. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed and indicate measurements on Shop Drawings.
- C. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural casework can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Comply with requirements of WI's quality standard of Premium Grade.
- B. Provide prefinished solid composite panels cabinet construction and shelving typically throughout and as follows, unless otherwise noted:
 - 1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Trespa Athlon as manufactured by Trespa North America Ltd., Poway, CA, Telephone: 800-487-3772; website: www.trespa.com, local representative: MF Murray Companies, Inc., Brisbane, CA, Phone: 415-468-1222, or approved equal.
 - 2. Provide 3/4-inch-thick panels for typical cabinet construction including sides, tops, and bottoms, face frames, shelves, and for doors and drawer fronts. Provide 1/2-inch-thick panels for drawer sides and 1/4-inch-thick panels for drawer bottoms.

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- C. Plywood Veneer Products at Bedroom Lockers:
1. Veneer Plywood shall be as manufactured by Roseburg, P.O. Box 1088, Roseburg, OR 97470; 10599 Old HWY 99 S. Dillard, OR 97432; telephone: (541) 679-3311, Fax: (541) 679-2543, Toll Free (800) 245-1115; or approved equal.
 - a. Hardwood plywood with stain and transparent finish.
 - b. Cherry PS veneers; book match.
 - c. Core: CFC - Combination Fiber Core (CFC)
 - d. Cherry veneers to match with hardwood plywood drawer and doors fronts.
 - e. Provide 3/4-inch-thick, panels for drawer and door fronts.
 - f. Stained and transparent finished wood standing and running trim: Solid stock Cherry.
 - g. Finish color: Alpine Finish AL07 (to match wood doors).
- D. Solid-Surfacing Material for Countertops and Vanity Tops with Integral Sinks:
1. Cast, filled, acrylic; not coated, laminated or of composite construction, meeting ANSI Z124 1980, Type Six, and FS WW-P-541E/GEN dated August 1, 1980.
 - a. Product: E.I. duPont de Nemours & Co. Inc., Corian® Surfaces, or approved equal.
 - b. Provide 1/2-inch-thick panels unless otherwise indicated on the Drawings.
 - c. Colors/Patterns: Refer to drawings.
- E. Solid-Surfacing Material for Cladding of Walls and Ceilings of Showers:
1. Cast, filled, acrylic; not coated, laminated or of composite construction, meeting ANSI Z124 1980, Type Six, and FS WW-P-541E/GEN dated August 1, 1980.
 - a. Product: E.I. duPont de Nemours & Co. Inc., Corian® Surfaces, or approved equal.
 - b. Provide 1/4-inch-thick panels unless otherwise indicated on the Drawings.
 - c. Recessed Shelving Unit: GRIFform® Shower Caddy- SSC3067
 - d. Colors/Patterns: Refer to drawings.
- F. Stainless Steel Countertops and Integral Sinks:
1. Provide stainless steel sheet with No. 4 finish conforming to general requirements specified in Section 055000, METAL FABRICATIONS.
 2. Provide 14-gauge sheet for countertops with integral sinks. Provide 18-gauge sheet when backed with Marine Grade plywood, minimum 3/4-inch thick.
 3. Back Splash: Full height to underside of cabinets, unless otherwise indicated on the Drawings; Top Edge: 45-degree angle.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

4. Front Edge Treatment: Marine edge (fully formed rolled no-drip edge); turned-down 2 inches, and back at 15-degree angle, with 1-1/8-inch turn under.

2.02 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 087100, DOOR HARDWARE.
- B. Typical hardware, except where specifically indicated otherwise:
 1. Pulls at Drawers and Doors (U-shaped pulls per CBC 1125B.4):
 - a. Manufacturer: Trimco, #562-4, or approved equal.
 - b. Finish: Stainless Steel.
 - c. One per drawer unless otherwise shown, 3 inches center-to-center.
 2. Hinges at 3/4-Inch Thick Doors:
 - a. WI Grade 1, minimum 165/170-degree-swing.
 - b. Provide 1 pair per door up to 3 feet high, with additional for larger doors as recommended by manufacturer.
 - c. Manufacturer and Type: Rockford (RPC) #374 Five Knuckle Overlay Hinge, Stainless Steel or approved equal.
 3. Drawer Slides:
 - a. Manufacturer: Accuride, types as listed below, or approved equal.
 - b. Typical, unless otherwise noted: #3832-SC (100-lb load capacity).
 - c. File Drawers: #4037 (150-lb load capacity).
 - d. Paper Storage: #3640 (200-lb load capacity).
 - e. Type: Full Extension, ball bearing.
 - f. Finish: Nickel Plated.
 4. Cabinet Door and Drawer Locks (where indicated on Drawings):
 - a. Manufacturer: National Cabinet Lock or approved equal.
 - b. Cabinets: Model C8173, C8174, or C8175.
 - c. Drawers: Model: C8177, C8178, or C8179.
 - d. Finish: Polished nickel.
 - e. Provide elbow catch at “inactive” door of a pair.
 5. Catches:
 - a. Manufacturer: Knappe & Vogt Mfg. Co., or approved equal.
 - b. #918 ALUM heavy-duty magnetic.
 6. Shelf Rests:
 - a. Manufacturer: Hettich
 - b. Sekura Clip, Model No. 019 557, Nickle plate. Seismic hold down required.
 7. Door and Drawer Silencers:
 - a. Manufacturer: BBW Model “W06”, Gray rubber, or approved equal.
 8. Wire Management Grommets:
 - a. Manufacturer: Doug Mockett & Co., Model “MG Series,” or approved equal.

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- b. Plastic, matte black, 1-7/8 inches outside diameter. Provide a grommet at every desk or open countertop.
 - 9. Heavy Duty Closet Hang Rods and/or Poles and Brackets:
 - a. Manufacturer: Engineered Product Company (EPCO), or approved equal.
 - b. EPC-870-6, polished stainless steel closet rod, 72-inch by 1-1/16-inch diameter; material thickness: minimum .083-inch +/- .005.
 - c. Brackets: EPC-850-SS Open Flange and EPC-860-SS Closed Flange Closet Rod Supports; polished stainless steel.
 - 10. Mirrors:
 - a. "Glassworks" – MR12X24.
 - b. Clear Mirror.
 - c. Flat Polish All Edges.
 - d. Wide: 12 inches.
 - e. Height: 24 inches.
 - f. Thickness: 1/4-inch.
 - g. Attach with continuous stainless-steel channel, top and bottom
 - 11. Lazy Susan:
 - a. "Rev-A-Shelf" - Wood Classic Pie Shape Lazy Susan.
 - b. 1-5/8-inch Solid wood frame, Finger joint.
 - c. 5/8-inch-thick natural maple shelf bottom.
 - d. Mount to the door: Chrome hardware.
 - e. Telescoping post 26 inches – 32 inches H TSCA.
- C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
- 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Satin Stainless Steel: BHMA 630.
- D. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.03 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Metal framing, sheet metal straps as indicated in Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Wood Glues: 30 g/L.
 2. Contact Adhesive: 250 g/L.

2.04 FABRICATION, GENERAL

- A. Casework and Countertop Grade: Unless otherwise indicated, provide premium-grade casework and countertops complying with referenced quality standard.
- B. Fabricate casework and countertops to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4-Inch Thick or Less: 1/16-inch.
 2. Edges of Rails and Similar Members More Than 3/4-Inch Thick: 1/8-inch.
- C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 1. Seal edges of openings in countertops with a coat of varnish.

2.05 GENERAL CABINET FABRICATION

- A. Grade: WI Premium:
 1. Construction Style: Style A, Frameless.
 2. Construction Type: Type I, multiple self-supporting units rigidly joined together.
 3. Door and Drawer Front Style: Flush overlay.
- B. Cabinetry and Shelving of Solid-Composite Panels:
 1. Materials: Prefinished solid composite panels with exposed solid phenolic edges.
 2. Provide 1/2-inch-thick panels for typical cabinet construction including sides, tops, and bottoms, face frames, shelves, and for doors and drawer fronts.
 3. Provide 1/2-inch-thick panels for drawer sides and drawer bottoms.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

4. Semi-exposed interior finish color to match exposed panels.
- C. Cabinetry and Shelving of Plywood Veneer:
1. Materials: Hardwood plywood with stain and transparent finish;
 2. Provide 3/4-inch-thick panels for typical cabinet construction including sides, tops, and bottoms, face frames, shelves, and for doors and drawer fronts.
 3. Provide 1/2-inch-thick panels for drawer sides and 1/4-inch-thick panels for drawer bottoms.

2.06 SOLID-SURFACING COUNTERTOPS

- A. Grade: WI Premium.
- B. Fabricate countertops and backsplashes in one piece, unless otherwise indicated.
1. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 2. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - a. Exposed front and side edges of countertops shall be minimum 1-1/2 inches.
 - b. Fabricate tops with shop-applied backsplashes.
 - c. Front Edge Treatment for Countertops with Integral Sinks: Fully-formed, no-drip edge; turned-down 2 inches.
 3. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before installing architectural casework, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.
1. Before installing, condition casework to average prevailing humidity conditions in area of installation.

3.02 INSTALLATION

- A. Assemble casework and complete fabrication at Project site to comply with WI requirements for Premium Grade, to extent that it was not completed in the shop. Install casework to comply with requirements for WI Premium Grade.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

- B. Install casework level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8-inch in 96 inches.
- C. Scribe and cut casework to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor casework to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use finishing screws for exposed fastening, countersunk and filled flush with casework panel and matching final finish if transparent finish is indicated.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of material available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8-inch in 96 inches.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 8 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.
 - 4. Calk space between backsplash and wall with sealant specified in Section 079200, JOINT SEALANTS.

SECTION 064023 – INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS

- H. Solid-Surfacing Cladding for Shower Walls and Ceilings:
 - 1. Use 100 percent silicone sealant for bonding sheets of solid-surfacing to walls in accordance with manufacturers printed instructions, including silicone thickness and placement.
 - 2. Provide hard-seamed outside corners.
 - 3. Provide “soft” silicone seams at inside corners of walls and ceilings with wedge trim of solid-surfacing to allow for expansion.
 - 4. Seal all joints between panels and between panels and adjacent materials with 100 percent silicone sealant in accordance with manufacturers’ recommendations.

- I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - 1. Clean, lubricate, and adjust hardware.

- B. Clean woodwork on exposed and semi-exposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION

DIVISION 07
THERMAL AND MOISTURE
PROTECTION

SECTION 071235

SELF-ADHERING SHEET WATERPROOFING/FLASHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Related Sections
 1. Section 030000, CAST-IN-PLACE CONCRETE, for slab to wall protection.
 2. Section 054000, COLD-FORMED METAL FRAMING, flashing at openings.
 3. Section 061000, ROUGH CARPENTRY, for exterior plywood sheathing.
 4. Section 072113, EXTERIOR RIGID BOARD INSULATION, for exterior rigid insulation.
 5. Section 076200, SHEET METAL FLASHING AND TRIM, for waterproofing assemblies including sheet metal flashings.
 6. Section 074243, VENTILATED COMPOSITE WALL PANELS AND SOFFITS.
 7. Section 079200, JOINT SEALANTS, for joint-sealant materials and installation.
 8. Section 084413, ALUMINUM-FRAMED ENTRANCES AND STOREFRONT SYSTEMS, for operable and fixed window units wall assemblies.
 9. Section 084400, GLAZED ALUMINUM CURTAIN WALL SYSTEM, for curtain wall assemblies and louvers.

1.02 SUMMARY

- A. Section provides for a flexible rubberized asphalt, self-sealing sheet and through-wall flashing and wall flashing accessories.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM E96, Test Methods for Water Vapor Transmission of Materials.
 2. ASTM D570, Test Method for Water Absorption of Plastics.

SECTION 071235 – SELF-ADHERED SHEET WATERPROOFING/FLASHING

3. ASTM E154, Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.
4. ASTM D1004, Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
5. ASTM D1938, Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method.
6. ASTM D1876, Test Method for Peel Resistance of Adhesives.
7. ASTM D1970, Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
8. D412, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.

1.04 SUBMITTALS

- A. Product Data and Shop Drawings: Submit for each product; Spec-Data®/Data Sheets, details and installation procedures.
- B. Test Reports: Indicating compliance with the performance requirements of this section.
- C. Samples of flashing.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's recommendations for storage and handling of each product.

1.06 WARRANTY

- A. Standard Product Warranty:
 1. Submit manufacturer's warranty that flashing and accessories are free of defects at time of delivery, and are manufactured to meet manufacturer's published physical properties and material specifications.
 2. Warranty Period: Five years from date of completion of the flashing installation.
 3. Installer to warrant that flashing and accessories have been installed in accordance with manufacturer's recommendations.

SECTION 071235 – SELF-ADHERED SHEET WATERPROOFING/FLASHING

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Flashing Description: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mils) of cross-laminated, high-density polyethylene film to provide a minimum 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- B. Provide product suitable for high temperatures when installed under sheet metal.
- C. Performance Requirements:
 - 1. Water Vapor Transmission: ASTM E96, Method B – 2.9 ng/m²sPa (0.05 perms) maximum.
 - 2. Water Absorption: ASTM D570 – maximum 0.1 percent by weight.
 - 3. Puncture Resistance: ASTM E154 – 356 N (80 lbs).
 - 4. Tear Resistance:
 - a. Initiation – ASTM D1004 – minimum 58 N (13.0 lbs) M.D.
 - b. Propagation – ASTM D1938 – minimum 40 N (9.0 lbs) M.D.
 - 5. Lap Adhesion at -4 deg C (25 deg F): ASTM D1876 – 880 N/M (5.0 lbs/inch) of width.
 - 6. Low Temperature Flexibility – ASTM D1970 – Unaffected to -43 deg C (-45 deg F).
 - 7. Tensile Strength: ASTM D412, Die C Modified – Minimum 5.5 MPa (800 psi).
 - 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C – Minimum 200 percent.
- D. Product: Perm-A-Barrier® Wall Flashing manufactured by Grace Construction Products or approved equal.
- E. Wall Flashing Accessories:
 - 1. Primer:
 - a. Description: High tack low VOC solvent based primer. 200 g/l max. VOC content.
 - b. Product: Bituthene Primer B2 LVC manufactured by Grace Construction Products.
 - 2. Termination Mastic:
 - a. Description: Rubberized asphalt-based mastic with 200 g/L max. VOC Content.
 - b. Product: Bituthene® Mastic manufactured by Grace Construction Products.

SECTION 071235 – SELF-ADHERED SHEET WATERPROOFING/FLASHING

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of flashing. Remove all deleterious materials from surfaces to be flashed.

3.02 INSTALLATION

- A. General: Install flashing to dry surfaces at air and surface temperatures of -4 deg C (25 deg F) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.
- B. Flexible Wall Flashing:
 - 1. Precut pieces of flashing to easily handled lengths for each location.
 - 2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 - 3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 - 4. Overlap adjacent pieces 50 mm (2 inches) and roll all seams with a steel hand roller.
 - 5. Trim bottom edge 13 mm (1/2 inch) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
 - 6. At heads, sills and all flashing terminations turn up ends a minimum of 50 mm (2 inches) and make careful folds to form an end dam, with the seams sealed.
 - 7. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
 - 8. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.
- C. Accessories:
 - 1. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply Perm-A-Barrier Primer Plus by air spray, brush or roller or apply Perm-A-Barrier WB Primer by brush or roller at the rate recommended by manufacturer, prior to flashing installation. Allow the primer to dry completely before flashing application.
 - 2. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations.
 - 3. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to flashing installation. Allow primer to dry completely before flashing application.

SECTION 071235 – SELF-ADHERED SHEET WATERPROOFING/FLASHING

END OF SECTION

SECTION 071417

SUB-GRADE PRE-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. The work of this Section includes, but is not limited to, the following:
 - 1. Type 1 – Self-Adhered Sheet water proofing system at under-grade concrete masonry unit elevator walls
 - 2. Type 2 – Pre-Applied Sheet Membrane – Adhesive-coated high-density polyethylene (HPDE) composite sheet waterproofing system for horizontal applications locations at elevator under-grade slabs, footings, and grade beams.
 - 3. Drainage systems and protection board.
 - 4. All primers, treatments, sealants, and system accessories.
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE.
 - 2. Section 042200, CONCRETE MASONRY UNIT.
 - 3. Section 076200, SHEET METAL FLASHING AND TRIM.
 - 4. Section 079200, JOINT SEALANTS.

1.03 REFERENCE STANDARDS

The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

- A. American Society for Testing and Materials (ASTM) – Self Adhered Sheet Waterproofing:
 - 1. ASTM C836, Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - 2. ASTM D412, Standard Test Methods for Rubber Properties in Tension.

SECTION 071417 – SUBGRADE PRE-APPLIED WATERPROOFING

3. ASTM D570, Standard Test Method for Water Absorption of Plastics.
 4. ASTM D882, Standard Test Methods for Tensile Properties of Thin Plastic Sheeting.
 5. ASTM D903, Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 6. ASTM D876, Standard Test Method for Peel Release of Adhesives (T-Peel).
 7. ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 8. ASTM D3767, Standard Practice for Rubber – Measurements of Dimensions.
 9. ASTM D5385, Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
 10. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.
 11. ASTM E154, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cove.
- B. ASTM – Under-slab Sheet Waterproofing:
1. ASTM C836, Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 2. ASTM C89, Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Separate Wearing Course.
 3. ASTM D41, Standard Test Methods for Rubber Properties in Tension.
 4. ASTM D90, Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 5. ASTM D164, Test Methods for Nonvolatile Content of Varnishes.
 6. ASTM D197, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 7. ASTM D3767, Standard Practice for Rubber – Measurements of Dimensions.
 8. ASTM D4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 9. ASTM D1709, Standard Test Methods for Impact Resistance of Plastic Films by the Free Falling Dart Method.
 10. ASTM D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 11. ASTM E96, Standard Test Method for Water Vapor Transmission of Materials.

SECTION 071417 – SUBGRADE PRE-APPLIED WATERPROOFING

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations, and recommendations.
- B. Shop drawings showing locations and extent of waterproofing including details for terminations and flashings, projections, penetrations, drains and treatment of substrate joints and cracks.
- C. Written documentation demonstrating installer qualifications under the "Quality Assurance" article including reference projects of a similar scope.
- D. Samples: Submit representative samples of the following for approval:
 - 1. Self-Adhered Sheet Waterproofing applied membrane.
 - 2. Pre-applied Sheet Waterproofing membrane.
 - 3. Prefabricated drainage composite.
 - 4. Protection board.
- E. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.08, Warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Waterproofing systems shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of waterproofing. The fluid applied composite sheet membrane waterproofing system must be supplied by single manufacturer. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past 5 years.
- B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
 - 1. Certification or written license from the Waterproofing Manufacturer that the Installer is a trained applicator.
 - 2. List of at least three projects contracted within the past 5 years of similar scope and complexity to this project.
 - 3. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.
 - 4. Installer's credentials must be approved by both the Architect and the Waterproofing Materials Manufacturer.
- C. Materials: Fluid applied composite sheet membrane waterproofing system shall be by single source manufacturer and shall consist of fluid applied waterproofing material, a two-part synthetic rubber based system free of isocyanates and bitumen and a composite sheet, a three-layer co-extruded biaxially-oriented HDPE integrally bonded to a non-woven geotextile. For each

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type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of surface preparation, minimum curing period, installation procedures, special details and flashings, inspection, testing, protection and repair procedures.
- E. Inspection and Testing: All areas shall be water tested following application and be inspected an individual trained and approved by the waterproofing systems manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and products in the original, unopened containers with seals unbroken, labeled with the manufacturer's name, product brand name and type, date of manufacture and directions for storage and use.
- B. Store and handle materials in strict compliance with manufacturer's instructions, recommendations, and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures, and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- C. Do not double-stack pallets of waterproofing on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- D. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
- E. Protect waterproofing materials from freezing.
- F. Store composite membrane. The composite membrane should be stored off the ground and not stacked more than 12 rolls high. Provide cover for material to protect top and sides
- G. Sequence deliveries to avoid delays but minimize on-site storage.

1.07 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

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- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive membrane waterproofing.
- C. Do not allow waste products (i.e., petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, acids, etc.) to come into contact with the waterproofing membrane. Any exposure to foreign materials or chemical discharges must be presented to the Membrane Manufacturer to determine the impact on the waterproofing assembly performance.
- D. Horizontal Application – Concrete Deck Surface condition:
 - 1. A minimum slope to drain of 1/8-inch/foot shall be used on all concrete decks. This is best achieved with a monolithic structural slab and not with a separate concrete fill layer.
 - 2. Ensure no excessive deflection or movement of the deck or other structural problems.
 - 3. The deck shall provide for support of the maximum anticipated dead and environmental loads and for expansion and contraction suitable for the roof system structure.
 - 4. All projections, penetrations, and openings in the deck should be completed before the waterproofing application begins.
 - 5. Joints in pre-cast/pre-stressed concrete decks are to be grouted so that the top surface is level and smooth before membrane application.
- E. Subgrade/Wall Preparation: Refer to Section 3.02, Preparation of Substrates.
- F. General contractor shall assure adequate protection and ventilation during the application of the Waterproofing assembly.

1.08 WARRANTY

- A. Sheet Membrane Waterproofing: Provide written 5-year material warranty issued by the membrane manufacturer upon completion of work.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.

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3. Subject to the requirements of Division 01, General Requirements, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Basis of Design Manufacturer:
1. Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA.
 2. Or approved Equal System

2.02 MATERIALS

- A. Waterproof membrane Type 1- Vertical Walls Post Applied.
- B. Waterproof membrane Type 1- Vertical Walls Post Applied Sheet Membrane Waterproofing System:
1. Bituthene® System 4000 Membrane by GCP Advanced technologies Construction Products; a self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056-inch) of rubberized asphalt and 0.1 mm (0.004-inch) of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.
- C. Sheet Membrane Waterproofing:

Physical Properties for Bituthene System 4000 Membrane

Property	Test Method	Typical Value
Color		Dark gray-black
Thickness	ASTM D3767 Method A	1.5 mm (0.060 inch) nominal
Flexibility, 180-degree bend over 25 mm (1 inch) mandrel at -43 deg C (-45 deg F)	ASTM D1970	Unaffected
Tensile Strength, Membrane Die C	ASTM D412 Modified ¹	2240 kPa (325 lbs/in. ²) minimum
Tensile Strength, Film	ASTM D882 Modified ¹	34.5 MPa (5,000 lbs/in. ²) minimum
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D412 Modified ¹	300% minimum
Crack Cycling at -32 deg C (-25 deg F), 100 Cycles	ASTM C836	Unaffected
Lap Adhesion at Minimum Application Temperature	ASTM D1876 Modified ²	880 N/m (5 lbs/inch)
Peel Strength	ASTM D903 Modified ³	1576 N/m (9 lbs/inch)
Puncture Resistance, Membrane	ASTM E154	222 N (50 lbs) minimum
Resistance to Hydrostatic Head	ASTM D5385	70 m (231 ft) of water
Permeance	ASTM E96, Section 12 – Water Method	2.9 ng/m ² sPa (0.05 perms) maximum

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Property	Test Method	Typical Value
Water Absorption	ASTM D570	0.1% maximum

1. The test is run at a rate of 50 mm (2 inch) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 50 mm (2 inch) per minute at -4 deg C (25 deg F).
3. The 180-degree peel strength is run at a rate of 300 mm (12 inches) per minute.

- D. Prefabricated Drainage Composite: (Hydroduct® 220 – vertical applications) (Hydroduct® 660 – horizontal applications) Drainage Composite by GCP Advanced technologies Construction Products. Drainage Composite shall be designed to promote positive drainage while serving as a protection course.
- E. Protection Board:
1. Expanded Polystyrene Protection Board: 25 mm (1-inch) thick for vertical applications with the following characteristics.
 - a. Normal Density: 16 kg/m³ (1.0 lb/ft³).
 - b. Thermal Conductivity, K factor: 0.24 at 5 deg C (40 deg F), 0.26 at 24 deg C (75 deg F).
 - c. Thermal Resistance, R-Value: 4 per 25 mm (1 inch) of thickness.
 2. Adhere to waterproofing membrane with Bituthene Protection Board Adhesive.
- F. Asphalt Hardboard: A premolded semi-rigid protection board consisting of bitumen, mineral core, and reinforcement. Provide 3 mm (0.125-inch) thick hardboard on horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two layers of 3 mm (0.125 inch) thick hardboard or one layer of 6 mm (1/4-inch) thick hardboard.
- G. Waterstop: Adcor™ ES hydrophilic non-bentonite waterstop by GCP Advanced technologies Construction Products for non-moving concrete construction joints.
- H. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape, and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

2.03 MATERIALS

- A. Waterproof membrane Type 2 – Pre-Applied Below Slab:
1. Waterproof Membrane Type 2 – Horizontal pre-Applied below slab, footings and grade beams system.
 2. Pre-applied Integrally Bonded Sheet Waterproofing Membrane: Preprufe® 300R Plus Membrane by GCP Advanced Technologies Construction Products, a composite sheet membrane comprising 0.5 mm (0.020 inch) of high-density polyethylene film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and

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permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete.

B. Provide membrane with the following physical properties:

Physical Properties for Preprufe 300r Plus Membrane

Property	Test Method	Typical Value
Color		White
Film Thickness	ASTM D3767 Method A	1.2 mm (0.046 inch) nominal
Lateral Water Migration Resistance	ASTM D5385, Modified ¹	Pass at 231 ft (71 m) of hydrostatic head pressure
Low Temperature Flexibility	ASTM D1970	Unaffected at -29 deg C (-20 deg F)
Resistance to Hydrostatic Head	ASTM D5385, Modified ²	231 ft (71m)
Elongation	ASTM D412 Modified ³	500%
Crack Cycling at -23 deg C (-9.4 deg F), 100 Cycles	ASTM C836 ⁴	Unaffected, Pass
Tensile Strength, Film	ASTM D412	27.6 MPa (4,000 lbs/in. ²) minimum
Peel Adhesion to Concrete	ASTM D903 Modified ⁵	880 N/m (5.0 lbs/inch)
Lap peel adhesion at 72 deg F (22 deg C)	ASTM D5385 Modified ⁶	8lbs/in. (1408N/m)
Lap peel adhesion at 40 deg F (4 deg C)	ASTM D5385 Modified ⁶	8lbs/in. (1408N/m)
Puncture Resistance	ASTM E154	990 N (221 lbs) minimum
Permeance to water, Vapor Transmission	ASTM E96 Method B	<0.6 ng/m ² sPa (0.01 perms)

1. Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
2. Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 3 mm (0.125-inch) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
3. Elongation of membrane is run at a rate of 50 mm (2 inches) per minute.
4. Concrete is cast against the Preprufe membrane and allowed to cure (7 days minimum). Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum).
5. Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 inches) per minute at room temperature.
6. The test is conducted 15 minutes after the lap is formed (per GCP published recommendations) and run at a rate of 50 mm (2 inches) per minute at 72 deg F (22 deg C).

C. System Components

1. Preprufe 300R Plus — heavy-duty grade for use below slabs and on rafts (i.e., mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
2. Preprufe Tape LT — for covering cut edges, roll ends, penetrations and detailing (temperatures between 25 deg F (-4 deg C) and 86 deg F (+30 deg C)).

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3. Preprufe Tape HC – for covering cut edges, roll ends, penetrations and detailing (minimum 50 deg F (10 deg C)).
4. Preprufe CJ Tape LT — for construction joints, and detailing (temperatures between 25 deg F (-4 deg C) and 86 deg F (+30 deg C)).
5. Preprufe CJ Tape HC — for construction joints, and detailing (minimum 50 deg F (10 deg C)).
6. Bituthene® Liquid Membrane—for sealing around penetrations, etc.
7. Adcor® ES — waterstop for joints in concrete walls and floor.
8. Preprufe Tieback Covers — preformed cover for soil retention wall tieback heads.
9. Preprufe Preformed Corners—preformed inside and outside corners.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate, and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stones, and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Concrete Masonry Unit Substrates – Walls:
 1. Do not proceed with installation until concrete masonry walls have properly cured and dried.
 2. If time is critical Bituthene® Primer B2 may be used to allow priming and installation of membrane sooner than 7 days. Priming may begin in this case as soon as the concrete masonry unit will maintain structural integrity.
 3. Fill joints and finish flush with surrounding surface.
 4. Repair bugholes over 13 mm (1/2-inch) in length and 6 mm (1/4-inch) deep and finish flush with surrounding surface.
 5. Grind irregular construction joints to suitable flush surface.
 6. Related Materials: Treat joints, penetrations and install flashing as recommended by waterproofing manufacturer.

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- C. Cast-In-Place Concrete Substrates Horizontal:
1. It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 12 mm (0.5 inch). Grout around all penetrations such as utility conduits, etc. for stability.
 2. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Fill gaps or voids greater than 1/2-inch (13 mm). Remove standing water prior to membrane applications.

3.03 INSTALLATION

- A. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
1. Installation, Self-Adhering Vertical Applications:
 - a. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
 - 1) Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
 - 2) Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.
 - 3) Seal daily terminations with troweled bead of mastic.
 - 4) Apply drainage/protection board and related materials in accordance with manufacturer's recommendations.
 2. Installation, Pre-Applied Horizontal Applications:
 - a. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
 - 1) Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
 - 2) Accurately position succeeding sheets to overlap the previous sheet 75 mm (3 inch) along the marked lap line. Ensure the membrane lays flat without any openings. End laps should be staggered to avoid a buildup of layers.
 - 3) Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.
 3. To prevent the membrane from moving and fish mouths opening, the laps should be fastened together at maximum 1.0 m (39 inches) on center. Fix through the center of the lap area using 12 mm (1/2-inch) long washer-head self-tapping screws or similar allowing the head of the screw to bed into the adhesive compound to self-seal. It is not necessary to fix the membrane to the substrate, only to itself.

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4. Ensure the membrane lays flat and no openings occur. Additional fastening may be required at corners, details etc.
5. Protection:
 - a. Protect membrane in accordance with manufacturer's recommendations until placement of concrete. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

3.04 CLEANING AND PROTECTION

- A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work.
- B. A protection course should always be installed as soon as possible after completion of the waterproofing installation and flood testing to protect the membrane from mechanical damage and UV.
- C. Install any protection, drainage, and insulation courses according to the manufacturer's instructions.

END OF SECTION

SECTION 071900
WATER REPELLENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section Includes:
 - 1. Water-repellent treatment for the following surfaces:
 - a. All exposed Concrete Masonry Units (CMU) and Concrete surfaces, including:
 - 1) Exterior CMU on fire station, trash enclosure, site walls and BBQ.
 - 2) Exposed Concrete surfaces at BBQ, screen wall and flag pole.
- C. Related Sections:
 - 1. Section 033330, CONCRETE FLOOR SEALER, and Section 033550, POLISHED CONCRETE FLOOR FINISHING, for sealers at interior concrete floors.
 - 2. Section 042200, CONCRETE UNIT MASONRY, for CMU types to receive coatings.
 - 3. Section 079200, JOINT SEALANTS, for installation of exterior joint sealants.

1.02 PERFORMANCE REQUIREMENTS

- A. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.
- B. Water Repellents: Comply with performance requirements specified, as determined by testing on manufacturer's standard substrate assemblies representing those indicated for Project.

SECTION 071900 – WATER REPELLENTS

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C140-07, Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
 - 2. ASTM C642-06, Test Methods for Density, Absorption, and Voids in Hardened Concrete.
 - 3. ASTM D1653-03, Test Methods for Water Vapor Transmission of Organic Coating Films.
 - 4. ASTM D6532-06, Test Method for Evaluation of the Effect of Clear Water Repellent Treatments on Water Absorption of Hydraulic Cement Mortar Specimens.
 - 5. ASTM E96-05, Test Methods for Water Vapor Transmission of Materials.
 - 6. ASTM E514-06, Test Method for Water Penetration and Leakage through Masonry.
 - 7. ASTM E1857-04, Guide for Selection of Cleaning Techniques for Masonry, Concrete, and Stucco Surfaces.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
 - 1. Include manufacturer's printed statement of VOC content.
 - 2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
- C. Samples: For each type and color of water repellent and substrate indicated, 12 inches by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.
- D. Qualification Data: For qualified Applicator.
- E. Product Certificates: For each type of water repellent, from manufacturer.
- F. Field quality-control reports.
- G. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and/or approved by manufacturer.

SECTION 071900 – WATER REPELLENTS

- B. Mockups: Apply water repellent to each type of substrate required.
 - 1. Locate each test application as directed by Engineer.
 - 2. Size: 10 sq.ft.
 - 3. Final approval by Engineer of water-repellent application will be from test applications.
- C. Pre-installation Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
 - 1. Maintain ambient temperature above 20 deg F during and 24 hours after installation.
 - 2. Do not proceed with application on materials if ice or frost is covering the substrate.
 - 3. Do not proceed with application if ambient temperature of surface exceeds 100 deg F.
 - 4. Do not proceed with the application of materials in rainy conditions or if heavy rain is anticipated with 4 hours after application.
- B. Sealer Coordination: Verify compatibility with curing compounds, patching materials, repair mortar, paints, sealants, etc. to be used on masonry surfaces to ensure compatibility with the water repellent.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency specified below within specified warranty period.
 - 1. Loss of water repellency:
 - a. CMU: 1.0 ml/20 minutes or greater (60 mph wind driven rain equivalent).
 - b. Concrete: 1.0 ml/20 minutes or greater (60 mph wind driven rain equivalent).
 - 2. Warranty Period: Ten years from date of Substantial Completion.

SECTION 071900 – WATER REPELLENTS

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Coatings for Exterior CMU and Concrete Surfaces:
1. Protectosil® Chem-Trete PB 100 as manufactured by Evonik Degussa Corporation, Parsippany, NJ, Phone: (800) 828-0919; Website www.protectosil.com.
 2. Or approved equal.

2.02 COATINGS

- A. Coating Description: Acceptable manufacturers and products for Concrete Masonry, minimum 100 percent solids.
- B. Product Qualifications:
1. Comply with the provisions of the following standards for CMU:
 - a. No change in the surface appearance to texture, no blotchy appearance.
 - b. ASTM E514 – Water Permeance of Masonry:
 - 1) 100 percent reduction in leakage rate over the control wall.
 - 2) Control wall must have a leakage rate of at least 6.0 liters/hours.
 - c. ASTM C140 – Concrete Masonry Units, 24-hour water soak:
 - 1) 99.6 percent reduction in water absorption.
 - 2) Control should absorb at least 5 percent water.
 - d. Penetration: 0.25 inches average.
 2. Comply with the provisions of the following standards for concrete:
 - a. No change in the surface appearance to texture.
 - b. ASTM C642 “Water Absorption of Hardened Concrete” 48-hour water soak.
 - 1) less than 0.50 percent absorption.

SECTION 071900 – WATER REPELLENTS

- 2) Control (untreated) concrete absorbs more than 3.5 percent.
- c. ASTM C672 – Deicer Scaling of Concrete.
 - 1) Treated sample after 60 cycles.
 - 2) Untreated sample 5 after 40 to 50 cycles.
- d. Penetration: 0.20 inches average (on NCHRP #244 Concrete).
3. Regulatory Requirements:
 - a. Comply with State and local regulations concerning (AIM) Architectural, Industrial & Maintenance coatings regarding VOCs.
 - b. The use of 1,1,1 trichloroethane shall not be allowed.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
 2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 4. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
 1. CMU and Concrete: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E1857.
- B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

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- C. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
- D. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.03 FIELD QUALITY CONTROL

- A. Spray Test: After water repellent has dried, spray coated surfaces with water.
 - 1. After surfaces have adequately dried, recoat surfaces that show water absorption.
- B. Manufacturer's Field Services:
 - 1. Furnish written certification that surface preparation method and final condition has manufacturer's approval and comply with the warranty.
 - 2. Test area: Furnish results of test area absorption on each type of substrate.
 - 3. Test results shall determine application rate.
- C. Test Area:
 - 1. Before a sealer application the following field evaluation will be done. The cost of the field testing will be the responsibility of the Water Repellent Manufacturer.
 - 2. Prepare a 3 feet by 3 feet area to be sprayed with the water repellent. The area will be determined by the City. Apply the water repellents at specified rates. To produce a 6- to 8-inch rundown below the spray pattern.
 - 3. Allow five days for the sample to cure run a RILEM uptake test on the treated area.
 - 4. Place one tube on the brick and one tube on a mortar joint. City must be present for the application of the water repellent and the test.
 - 5. Acceptable minimum results are as stated in the warranty provisions. Coverage rate used to pass this test section must be used on entire project.

3.04 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellents and to instruct Applicator on the products and application methods to be used.

SECTION 071900 – WATER REPELLENTS

- B. Conform to manufacturer's instructions to achieve appearance conforming to accepted mock-ups. The following shall serve only as a general outline of the installation requirements.
- C. Apply at temperature and weather conditions recommended by the manufacturer.
- D. Product shall be applied as supplied by the manufacturer without dilution or alteration.
- E. Apply with a low-pressure (15 psi) airless spray equipment with a fan spray coarse nozzle, flooding the surface to obtain uniform coverage unless otherwise recommended by the manufacturer.
- F. Application Rates for Exterior Water Repellants (unless field tests determine a heavier rate of application is necessary to meet performance requirements):
 - 1. CMU: Apply two coats at a rate of not less than 75 square feet/gallon.
 - 2. Face Brick: Apply two coats at a rate of not less than 75 square feet/gallon.
- G. Follow manufacturers' recommendations concerning protection of glass, metal and other non-porous substrates. Contractor will be responsible to clean all surfaces that are contaminated by the water repellent.
- H. Follow manufacturer's recommendation concerning protection of plants, grass and other vegetation. Contractor will be responsible for replacing all plants, grass or vegetation damaged by the water repellent.
- I. Apply water repellent by brush only at locations where overspray would affect adjacent materials and where not practicable for spray application.
- J. Apply a second saturation coating, repeating first application.
 - 1. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats.
 - 2. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.05 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses.
 - 1. Correct damage to work of other trades caused by water-repellent application, as approved by Engineer.
 - 2. Comply with manufacturer's written cleaning instructions.

END OF SECTION

SECTION 072100
BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. This Section includes the following:
1. Glass-fiber blanket high-density thermal insulation with vapor barrier.
 2. Glass-fiber blanket high-density thermal insulation with foil face for exposed conditions.
 3. Glass-fiber blanket insulation for sound attenuation.
 4. Mineral wool insulation at fire rated assemblies.
- C. Related Sections include the following:
1. Section 054000, COLD-FORMED METAL FRAMING, for installation of metal wall, roof and ceiling assemblies.
 2. Section 061000, ROUGH CARPENTRY, for plywood sheathing.
 3. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING.
 4. Section 072113, EXTERIOR RIGID BOARD INSULATION, for exterior wall insulation.
 5. Section 072726, FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER, for exterior vapor barrier.
 6. Section 074243, VENTILATED COMPOSITE WALL PANELS AND SOFFITS, for exterior rain screen system.
 7. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING.
 8. Section 078413, PENETRATION FIRESTOPPING, for fire-rated joint fillers installed in penetrations of fire-rated walls and floors.
 9. Section 078446, FIRE-RESISTIVE JOINT SYSTEMS, for fire-rated perimeter joint fillers.
 10. Section 079200, JOINT SEALANTS, for acoustical sealant.
 11. Section 092900, GYPSUM BOARD, for installation of non-bearing metal partitions and assemblies with gypsum board finish of insulation specified by referencing this Section.
 12. Section 211000, FIRE SUPPRESSION SYSTEMS.
 13. Section 220000, PLUMBING.
 14. Section 230000, HEATING, VENTILATION, AND AIR CONDITIONING.

SECTION 072100 – BUILDING INSULATION

1.02 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
1. ASTM C553-08: Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 2. ASTM C665-06: Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 3. ASTM C920-08: Specification for Elastomeric Joint Sealants.
 4. ASTM C1289-08: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 5. ASTM C1320-05: Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 6. ASTM C1371-04a: Test Method for Determination of Emittance of Materials near Room Temperature Using Portable Emissometers.
 7. ASTM E84-09: Test Method for Surface Burning Characteristics of Building Materials.
 8. ASTM E119-08a: Methods for Fire Tests of Building Construction and Materials.
 9. ASTM E136-09: Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees Celsius.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Samples for Verification: Full-size units for each type of exposed insulation indicated.

SECTION 072100 – BUILDING INSULATION

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E84.
 - 2. Combustion Characteristics: ASTM E136.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Glass-Fiber Blanket Insulation (formaldehyde-free):
 - 1. CertainTeed Corporation.
 - 2. Johns Manville.
 - 3. Owens Corning.
 - 4. Or approved equal.

SECTION 072100 – BUILDING INSULATION

- C. Mineral Wool Insulation
 - 1. Acceptable Manufacturer: Thermafiber, Inc., which is located at: 3711 Mill St. ; Wabash, IN 46992; Toll Free Phone: (888) 834-2371; Phone: (260) 563-2111; Fax: 260-563-8979; Email: [request info](#); Website: www.thermafiber.com.
 - 2. Or approved Equal.

2.02 GLASS-FIBER BLANKET THERMAL INSULATION

- A. Thermal Insulation at Exterior Wall Cavity:
 - 1. Provide where vapor barrier is installed concealed and is in substantial contact with the unexposed surface of the wall finish.
 - 2. Product: High-Density Thermal Insulation: Certainteed High-Performance Fiber Glass Building Insulation. Fiber glass building insulation for walls. Complies with ASTM C665; preformed glass fiber batt insulation:
 - 3. Type: Kraft-faced, glass fiber insulation, ASTM C665, Type II, Class C.
 - a. Surface Burning Characteristics: N/R.
 - 4. Thicknesses and R-Values:
 - a. 6-inch-thick high-density batt insulation at 2 x 6 metal framing; R-value = 19.0.
- B. Thermal Insulation for Roof/Ceiling and Floor/Ceiling Assemblies (where fire rated assemblies are not required):
 - 1. Product: High-Density Thermal Insulation: Certainteed High-Performance Fiber Glass Building Insulation. Fiber glass building insulation for roof and floor/ceiling framing assemblies and exposed building assemblies.
 - 2. Type: Foil-faced, glass fiber insulation. Complies with ASTM C665; preformed glass fiber batt insulation:
 - a. Fire Hazard Classification: ASTM E84:
 - b. Maximum Flame Spread Index; 75.
 - c. Maximum Smoke Developed Index; 150.
 - d. Thermal Resistance: R of 30 (RSI 6.69).
 - e. Thickness: 12 inches (305 mm).
 - f. Width: 24 inches (610 mm).

2.03 GLASS FIBER BLANKET ACOUSTICAL INSULATION

- A. Acoustical Insulation for Floor/Ceiling Assemblies, Soffits, and Interior Partitions (where fire rated assemblies are not required):
 - 1. Product: Noise Reducer Batts by Certainteed or approved equal.
 - 2. Type: Unfaced glass fiber thermal insulation, ASTM C665 Type I and ASTM E136.
 - 3. Surface Burning Characteristics: Flame Spread Rating of Maximum 20, Smoke Developed: Maximum 20 when tested in accordance with ASTM E84

SECTION 072100 – BUILDING INSULATION

4. Sound Absorption Coefficient: 1.00 NRC minimum.
5. Thickness: Minimum 6-1/4 inches Ceiling; 6-inch partitions.

2.04 MINERAL WOOL INSULATION

- A. Safing Insulation:
 1. Type: Thermafiber Safing Insulation.
 - a. R-Value: 4.2 per inch.
 - b. Facing: Unfaced where enclosed
 - c. Facing: Foil Faced, where exposed
 - d. Standard Density: 4.0 pcf (actual).
 - e. Surface-Burning Characteristics: ASTM E84. Unfaced material will have a maximum flame spread 0 and smoke-developed of 0. Foil Faced material will have maximum flame spread 25 and smoke-developed of 0.

2.05 AUXILIARY MATERIALS

- A. Furring channels and non-bearing partitions as specified in SECTION 092900 Gypsum Board.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
- C. Acoustical Pads for Junction Boxes:
 1. Non-Fire Rated Conditions: As manufactured by Harry A. Lowry & Assoc., "Lowry's Electrical Box Sealer," or approved equal.
 2. Fire Rated Conditions: As manufactured by Nelson Fire Stop Pads, "Heavy-Duty/Nelson," or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
- B. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

SECTION 072100 – BUILDING INSULATION

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- F. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, use mechanical anchorage to provide permanent placement and support of units.
- G. Fill voids in completed installation with as recommended by insulation manufacturer.
- H. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- I. Install glass-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 - 4. For metal-framed construction, friction-fitted insulation into stud cavities prior to applying the interior finish.

SECTION 072100 – BUILDING INSULATION

3.03 INSTALLATION OF INSULATION IN PARTITIONS AND CEILINGS FOR SOUND ATTENUATION

- A. Install minimum 6-inch-thick, unfaced glass-fiber blanket insulation over ceilings at rooms with partitions extending 6 inches above the ceiling in a width that extends insulation 48 inches on either side of partition.
- B. In addition to required plumbing wall insulation and exterior insulation; install minimum 6-inch-thick, unfaced glass-fiber blankets acoustic insulation in partition walls, ceilings and floor/ceiling assemblies and as indicated on the drawings.

3.04 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072113

EXTERIOR RIGID BOARD INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section Includes:
 - 1. Continuous Exterior Insulation with protection board for exterior walls.
 - 2. Flashings and tapes.
 - 3. Nailboard fasteners.
- C. RELATED SECTIONS
 - 1. Section 033000, CAST-IN-PLACE CONCRETE.
 - 2. Section 054000, COLD-FORMED METAL FRAMING.
 - 3. Section 061000, ROUGH CARPENTRY.
 - 4. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING.
 - 5. Section 072100, BUILDING INSULATION.
 - 6. Section 072726, FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER, with Drainage Mat.
 - 7. Section 074243, VENTILATED COMPOSITE WALL PANELS AND SOFFITS.
 - 8. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING.

1.02 REFERENCES

- A. American Architectural Manufacturer's Association (AAMA):
 - 1. AAMA 508, Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.
 - 2. AAMA 509, Voluntary Test and Classification Method for Drained and Back Ventilated Rain Screen Wall Cladding Systems.
 - 3. AAMA 711, Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products.
 - 4. AAMA 714, Voluntary Specification for Liquid Applied Flashing Used to Create a Water-Resistive Seal around Exterior Wall Openings in Buildings.

SECTION 072113 – EXTERIOR RIGID BOARD INSULATION

5. AAMA 2605, ANSI/SBCA FS 100-2012 Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies.
- B. American National Standard for Installation (ANSI)/Structural Building Components Association (SBCA) FS 100-2012, Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies.
- C. Air Barrier Association of America (ABAA).
- D. American Society for Testing and Materials (ASTM):
 1. ASTM C209, Standard Test Methods for Cellulosic Fiber Insulating Board.
 2. ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 3. ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 4. ASTM D2126, Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
 5. ASTM E72, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 6. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 7. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.
 8. ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 9. ASTM E564, Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings.
 10. ASTM E2126, Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings.
 11. ASTM E2178, Standard Test Method for Air Permanence of Building Materials.
 12. ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- E. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.

SECTION 072113 – EXTERIOR RIGID BOARD INSULATION

- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 1. Accessories: Include details of all integral panel components and their interface with adjacent materials.
 - 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Verification Samples: For each finish product specified, two samples, minimum size 4 inches by 6 inches (102 mm x 150 mm).

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of 10 years' experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of 5 years demonstrated experience in installing products of the same type and scope as specified.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Remodel mock-up area as required to produce acceptable work.
- D. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, foundation/structural system/substrate conditions, and insulation manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle products per manufacturer's instructions until ready for installation.

SECTION 072113 – EXTERIOR RIGID BOARD INSULATION

1.06 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 WARRANTY

- A. Insulation Warranty: At project closeout, provide to Owner an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Rmax – A Business Unit of the Sika Corporation, which is located at 13524 Welch Road.; Dallas, TX 75244-5227; Toll Free: (800) 527-0890; Phone: (972) 387-4500; Fax: (972) 387-4673; Technical Phone: (972) 850-3604; Email: technical@rmax.com; Website: www.rmax.com.
- B. Or approved equal.

2.02 BOARD FACED INSULATION

- A. Nail Base Insulating Sheathing, Consisting of Polymer-Coated Glass Fiber Mat-Faced, Polyisocyanurate-Foam Insulation Bonded to Plywood: ASTM C1289, Type V with Type II, Class 2, rigid, cellular polyisocyanurate thermal insulation.
 - 1. Basis of Design: Rmax; ThermaBase-CI (DS).
 - 2. Flame Spread Index and Smoke Contribution per ASTM E84:
 - a. Flame: 25 or less for foam insulation component at thickness of 1 inch (25 mm) or greater;
 - b. Flame: 75 or less for plywood or OSB component.
 - c. Smoke: 450 or less.

SECTION 072113 – EXTERIOR RIGID BOARD INSULATION

3. Water Vapor Permeability per ASTM E96 desiccant method: 1.5 perm or less.
4. Air Permeability per ASTM E2178: 0.004 cfm per sq.ft. (1.2192 L per min per square mile) or less.
5. Compressive Strength per ASTM D1621: 25 psi (172 kPa).
6. R-Value per ASTM C518: R-12.1 minimum at thickness of 2 inches (51 mm).
7. Nailable Material and Thickness:
 - a. Plywood Nominal Thickness, Exposure 1: 5/8 inch (15.9 mm).

B. FLASHINGS AND TAPES

1. R-SEAL 6000: Woven polyethylene penetration flashing membrane with butyl rubber adhesive.
 - a. Liner: Low Density Polyethylene (LDPE).
 - b. Width: 9 inches (229 mm).
 - c. Thickness: 35 mils (0.89 mm).

2.03 NAILBOARD FASTENERS

- A. Nailboard Fasteners: Insulation Panel fasteners for use in composite nail board application
 1. Head: 5/8-inch (15.85 mm) oversized flat head.
 2. Thread Major Diameter: 0.245-inch (6.22 mm).
 3. Shank Diameter: 0.190-inch (4.82 mm).
 4. Point: #14 #3 square drive, drill point.
 5. Finish: Standard gray e-coating.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

SECTION 072113 – EXTERIOR RIGID BOARD INSULATION

3.03 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 072726

FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Fluid-applied membrane waterproofing and air barrier systems for ventilated rain screen application; vapor impermeable, installed at exterior walls and openings, and as noted on the construction documents.
- B. Related Sections:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE, for slab to wall protection.
 - 2. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING, for self-adhering underlayment and flashings as indicated on drawings.
 - 3. Section 071417, SUBGRADE PRE-APPLIED WATERPROOFING.
 - 4. Section 072113, EXTERIOR RIGID INSULATION, for exterior rigid insulation with cover board.
 - 5. Section 074243, VENTILATED COMPOSITE WALL PANELS AND SOFFITS, for waterproofing at rain screen system.
 - 6. Section 076200, SHEET METAL FLASHING AND TRIM, for sheet metal flashings.
 - 7. Section 079200, JOINT SEALANTS, for joint-sealant materials and installation.

1.03 DEFINITIONS

- A. ABAA: Air Barrier Association of America.
- B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

SECTION 072726 – FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER

1.04 PERFORMANCE REQUIREMENTS

- A. Provide an air and vapor barrier system to perform as a continuous barrier to air infiltration/exfiltration and water vapor transmission and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.
- B. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - 1. Foundation and walls.
 - 2. Walls and windows or doors.
 - 3. Different wall systems.
 - 4. Wall and roof.
 - 5. Wall and roof over unconditioned space.
 - 6. Walls, floor and roof across construction, control and expansion joints.
 - 7. Walls, floors and roof to utility, pipe and duct penetrations.
- C. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.
- D. Air Barrier Assembly Air Leakage: Not to exceed 0.00120 L/s/m² per ASTM E2178.

1.05 REFERENCED STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM C836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - b. ASTM D412 Standard Test Methods for Rubber Properties in Tension.
 - c. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - d. ASTM D1644 Test Methods for Non-volatile Content of Varnishes.
 - e. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - f. ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - g. ASTM D3767 Standard Practice for Rubber – Measurements of Dimensions.

SECTION 072726 – FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER

- h. ASTM E96 Test Methods for Water Vapor Transmission of Materials.
- i. ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- j. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
- k. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

1.06 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product data, installation instructions, and substrate preparation recommendations.
- C. Shop Drawings: Show the locations and extent of air and vapor barrier system including details of typical conditions, intersections with other envelope systems and materials, membrane counter-flashings and details showing how gaps in the construction will be bridged and how miscellaneous penetrations such as conduits, pipes, etc. are sealed. Submit documentation from manufacturer that air barrier materials and accessories are compatible.
- D. Samples: Submit representative samples of the following for approval: Cured sample of the fluid-applied, transition, and through-wall flashing membranes, as well as certification by air and vapor barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- E. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 1. Include details of interfaces with other materials that form part of air barrier.
 - 2. Include details of mockups.
- F. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- G. Qualification Data: For Applicator. Demonstrate the installer's qualifications under the "Quality Assurance" article.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

**SECTION 072726 – FLUID-APPLIED WATERPROOF MEMBRANE
AND AIR BARRIER**

1.07 QUALITY ASSURANCE

- A. Manufacturer: Air and vapor barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years of experience in the production and sales of waterproofing and air barrier products. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past five years.

- B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
 - 1. List of at least three (3) projects contracted within the past five (5) years of similar scope and complexity to this project carried out by the firm and site supervisor.
 - 2. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.

- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
 - 1. Review of submittals.
 - 2. Review of surface preparation, minimum curing period and installation procedures.
 - 3. Review of special details and flashings.
 - 4. Sequence of construction, responsibilities and schedule for subsequent operations.
 - 5. Review of mock-up requirements.
 - 6. Review of inspection, testing, protection and repair procedures.

- D. Mock-up:
 - 1. Prior to installation of the air and vapor barrier systems a field-constructed mock-up shall be provided under the provisions of Section 013300, SUBMITTAL PROCEDURES, to verify details and tie-ins and to demonstrate the required quality of materials and installation.
 - 2. Apply air barrier and waterproof membrane as a part of a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, furring, cladding, window frame and sill, rigid board insulation, flashing and any other critical junction (roof, foundation, etc.).
 - 3. Allow 24 hours for inspection and testing of mock-up before proceeding with work.
 - 4. Mock-up cannot be a part of the work.
 - 5. Inspection and Testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air/vapor barrier membrane or waterproof membrane until it has been inspected, tested, and approved.

SECTION 072726 – FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations, and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures, and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- B. Do not double-stack pallets of fluid-applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- C. Protect fluid-applied membrane components from freezing and extreme heat.
- D. Sequence deliveries to avoid delays but minimize on-site storage.

1.09 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.

1.10 WARRANTY

- A. Submit manufacturer's warranty that air and vapor barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Submit manufacturer's warranty that waterproof membrane and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- C. Warranty Period: Five years from date of completion of the air barrier membrane installation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Products name or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.

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2. If “No substitutions” is indicated next to the product name, provide only products of listed manufacturers.
3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the Contractor.

B. General:

1. For each type of material required for the work of this Section, provide primary materials that are the products of one manufacturer.

2.02 FLUID APPLIED MEMBRANES

A. Fluid-Applied Vapor Barrier Between Exterior Rigid Insulation and Structure:

1. Product: PROSOCO R-Guard VB, manufactured by PROSOCO, Inc., Lawrence, KS, Telephone: (800) 255-4255, Website: www.prosoco.com
2. Subject to compliance with the following performance requirements:
 - a. Water Vapor Transmission ASTM E 96
 - b. Water Resistance ICC-ES AC2121; AATCC2 127
 - c. Air Permeance ASTM E 2178
 - d. Air Leakage of Air Barrier Assemblies ASTM E
 - e. Fastener Sealability ASTM D 1970
 - f. Pull Adhesion ASTM D 4541
 - g. Surface Burning Characteristics ASTM E 84
 - h. Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies NFPA3 285
3. Composition
 - a. Form: Viscous liquid, mild odor light green color
 - b. Specific Gravity: 1.34
 - c. pH: 7.5–10.0
 - d. WT/GAL: 11.12 lbs.
 - e. Total Solids: 62.5% ASTM D 2369
 - f. VOC Content: 45 g/L
 - g. Freeze Point: 32° F (0° C)

B. Fluid-Applied Water-Proof Membrane for Rain Screen Application:

1. Product: PROSOCO R-Guard Cat 5 Rain Screen, manufactured by PROSOCO, Inc., Lawrence, KS, Telephone: (800) 255-4255, Website: www.prosoco.com
2. Subject to compliance with the following performance requirements:
 - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
 - b. ICC-ES AC 212, Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing.
 - c. Air Barrier Association of America Acceptance (ABAA) Criteria for Liquid Applied Membranes.

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- d. Comply with national, state, and district AIM VOC: less than 30 grams per Liter
 - e. Air Leakage of Air Barrier Assemblies: Less than or equal to 0.04 cfm per square foot at 1.57 psf when tested in accordance with ASTM E2357.
 - f. Air Permeance: Less than or equal to 0.004 cfm per square foot (less than or equal to 0.02 L/s/sq m) when tested in accordance with ASTM E2178.
 - g. Water Vapor Transmission: 18 perms when tested in accordance with ASTM E96 (Wet Cup).
 - h. Total Solids: 99 percent.
- C. Liquid-Applied Flashing and Detailing Membrane:
- 1. Product: PROSOCO R-Guard FastFlash manufactured by PROSOCO, Inc., Lawrence, KS, Phone: (800) 255-4255, Website: www.prosoco.com.
 - 2. Subject to compliance with the following physical and performance requirements:
 - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
 - b. AAMA 714-12 Voluntary Specification for Liquid-Applied Flashing Used to Create a Water-Resistive Seal Around Exterior Wall Openings in Buildings.
 - c. ICC-ES AC 212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing.
 - d. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
 - e. Water Vapor Transmission: 21 perms when tested in accordance with ASTM E96.
 - f. Tensile Strength: Greater than 150 psi when tested in accordance with ASTM D412.
 - g. Elongation at Break: Greater than 350 percent when tested in accordance with ASTM D412.
 - h. Total Solids: 99 percent.
- D. Liquid Applied Fill Coat and Seam Filler:
- 1. Product: PROSOCO R-Guard Joint & Seam Filler, manufactured by PROSOCO, Inc., Lawrence, KS, Phone: (800) 255-4255, Website: www.prosoco.com.
 - 2. Subject to compliance with the following physical and performance requirements:
 - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
 - b. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
 - c. Water Vapor Transmission: Minimum 19 perms at 20 mils when tested in accordance with ASTM E-96.
 - d. Tensile Strength: 70 psi when tested in accordance with ASTM D412.

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- e. Elongation At Break: Greater than 180 percent when tested in accordance with ASTM D412.
 - f. Peel Strength: Greater than 25 pli when tested in accordance with ASTM D1781.
 - g. Total Solids: 99 percent.
- E. Interior Sealant for Windows and Doors:
- 1. Product: PROSOCO R-Guard AirDam, manufactured by PROSOCO, Inc., Lawrence, KS, Phone: (800) 255-4255, Website: www.prosoco.com.
 - 2. Subject to compliance with the following physical and performance requirements:
 - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
 - b. Comply with national, state and district AIM VOC: less than 30 grams per liter.
 - c. Sealant Validation from Sealant Waterproofing and Restoration Institute (SWRI).
 - d. Elongation At Break: Greater than 1000 percent when tested in accordance with ASTM D412.
 - e. Peel Strength: 25 pli when tested in accordance with ASTM C794.
 - f. Total Solids: 98 percent.
 - 3. Backer rod: In deep joints, control sealant depth by installing closed cell backer rod. Diameter of the soft-backer rod should be 25 percent greater than the joint width. Do not puncture backer rod.

PART 3 - EXECUTION

3.01 EXAMINATION AND SURFACE PREPARATION

- A. Examine conditions for compliance with system manufacturer's requirements for installation, and other specific conditions affecting performance of water and air barrier system.
- B. All surfaces must be sound, clean, and free of grease, dirt, excess mortar, or other contaminants. Fill or bridge damaged surfaces, voids, or gaps. Fill voids and gaps measuring one- inch or less with liquid applied fill coat and seam filler as necessary to ensure continuity.
- C. Surfaces to receive primary fluid applied air and water barrier must be dry, damp or wet to the touch. Brush away any standing water present before application. The products will tolerate rain immediately after application.
- D. Refer to manufacturer's product data sheets for requirements for condition of and preparation of substrates.
- E. Surfaces shall be sound and free of voids, spalled areas, loose aggregate, and sharp protrusions.

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- F. Remove contaminants such as grease, oil and wax from exposed surfaces.
- G. Remove dust, dirt, loose stone, and debris.
- H. Use repair materials and methods that are acceptable to manufacturer of the air and water-resistive barrier system.
- I. Refer to manufacturer's product data sheets and manufacturer's installation guidelines for additional information on preparing structural walls to receive the primary air and water resistive barrier.

3.02 EXTERIOR SHEATHING/PROTECTION BOARD

- A. Ensure that sheathing/Protection board is properly installed with ends, corners and edges properly fastened. Remove and replace damaged sheathing.
- B. Mechanical fasteners used to secure boards shall be set flush with sheathing, and spot overdriven fasteners with liquid applied fill coat and seam filler.
- C. Seal the cut edges of gypsum wall boards exposed in rough openings for windows and doors at corners.

3.03 MASONRY AND CONCRETE SUBSTRATES

- A. Masonry head and bed joints should be fully filled and tooled.
- B. Mechanically remove loose mortar fins, mortar accumulations and protrusions, and de-bris.
- C. Fill cracks, joints and gaps with liquid applied fill coat and seam filler as herein specified.

3.04 FIBER REINFORCED FILL COAT AND SEAM FILLER

- A. General: Comply with water and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply liquid applied fill coat and seam filler for seams, joints, cracks, gaps, primed rough gypsum edges at sheathing, and rough openings per manufacturer's written instructions.

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AND AIR BARRIER**

3.05 LIQUID APPLIED FLASHING AT WINDOWS, DOORS, OPENINGS AND PENETRATIONS

- A. General: Comply with water and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply liquid flashing membrane to seal and waterproof rough openings per manufacturer's written instructions. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural wall. Apply additional coats as needed to achieve void- and pinhole-free surface.

3.06 FLUID-APPLIED VAPOR BARRIER INSTALLATION

- A. General: Comply with vapor barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply to clean surfaces free of contaminants.
- C. Prior to Vapor Barrier installation fill, bridge and flash surface defects, over-driven fasteners, cut edges of sheathing, inside and outside corners, open joints, and seams per manufacturers requirements.

3.07 FLUID-APPLIED RAIN SCREEN AIR AND WATER-RESISTIVE BARRIER INSTALLATION

- A. General: Comply with water and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply fluid applied rain screen air and water-resistive barrier to a clean, dry and/or damp substrate, within temperature and weather limitations per manufacturer's written instructions.
- C. Apply to recommended thickness.
- D. Allow product to cure and dry.
- E. Inspect membrane before covering. Repair any punctures or damaged areas by applying additional material.
- F. Back roll as necessary to ensure there are no pinholes, voids or gaps in the membrane. Apply fluid-applied rain screen air and water-resistive barrier per manufacturer's recommendation.
- G. Apply additional coats per manufacturer's written instructions.

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3.08 FLUID APPLIED FLASHING TRANSITIONS

- A. General: Comply with water and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply fiber reinforced fill coat and seam filler as a liquid flashing membrane to waterproof the transitions in rough opening and between dissimilar materials per manufacturer's written instructions.
- C. Fill any voids between the top of the flashing leg and the vertical wall with fiber reinforced fill coat and seam filler.
- D. Spread the wet liquid flashing membrane to create a monolithic "cap-flash" flashing membrane per manufacturer's written instructions.
- E. Apply additional coats as needed to achieve void- and pinhole-free surface.
- F. Allow treated surfaces to skin before installing other wall assembly, waterproofing or air barrier components.

3.09 INTERIOR SEALANT FOR WINDOWS AND DOORS INSTALLATION

- A. General: Comply with water and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply interior waterproofing sealant per manufacturer's written instructions.
- C. Install Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Install Backer Rod as necessary per manufacturer's written instructions.
- D. Apply interior waterproofing sealant in continuous beads without gaps or air pockets.

3.10 PROTECTION

- A. Coordinate scheduling within installation of cover materials to ensure that fluid-applied air barrier system is not exposed to sunlight and weather longer than recommended by the system manufacturer.
- B. Ensure that the top edge of the fluid-applied air barrier and the roofing system is capped and sealed from water intrusion. Ensure the continuity of the fluid-applied air barrier system has been achieved.

END OF SECTION

SECTION 074213
METAL WALL PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Foamed-insulation-core vertical metal wall panel assembly with integral reveals and profiled panels, with related metal trim and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 054000, COLD-FORMED METAL FRAMING, for support framing for insulated core metal wall panels.
- B. Section 072726, FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER, for transition and flashing components of air/moisture barrier.
- C. Section 076200, SHEET METAL FLASHING AND TRIM, for sheet metal copings, flashings, reglets, and roof drainage items.
- D. Section 079200, JOINT SEALANTS, for field-applied joint sealants.

1.03 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 501.2, Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtainwalls and Sloped Glazing Systems.
 - 2. AAMA 508-07, Voluntary Test Method and Specifications for Pressure Equalized Rain Screen Wall Cladding Systems.
 - 3. AAMA 621, Voluntary Specification for High Performance Organic coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- B. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.

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C. ASTM International (ASTM):

1. ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
3. ASTM A755, Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
4. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
5. ASTM C645, Specification for Nonstructural Steel Framing Members.
6. ASTM C754, Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
7. ASTM C920, Specification for Elastomeric Joint Sealants.
8. ASTM C1363, Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
9. ASTM D968, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
10. ASTM D3359, Standard Test Methods for Measuring Adhesion by Tape Tests.
11. ASTM D4585, Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
12. ASTM D4587, Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
13. ASTM E72, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
14. ASTM E84, Test Methods for Surface Burning Characteristics of Building Materials.
15. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
16. ASTM E283, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
17. ASTM E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
18. ASTM E331, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
19. ASTM E1886, Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
20. ASTM E1996, Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

D. Factory Mutual Global (FMG):

1. ANSI/FMG 4880 Standard for Evaluating Insulated Wall & Roof/Ceiling Assemblies.

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2. ANSI/FMG 4881 Standard for Evaluating Class 1 Exterior Wall Assemblies.
 3. ANSI/FMG 4882 Standard for Evaluating Walls and Ceilings for Smoke Sensitive Occupancies
- E. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):
1. Architectural Sheet Metal Manual.
- F. Underwriters Laboratories, Inc. (UL):
1. UL 263, Fire Tests of Building Construction and Materials.
 2. UL 1040, Fire Test of Insulated Wall Construction.
 3. UL 1715, Fire Test of Interior Finish Material
 - a. Backer Flash and IMV. Provide a minimum 5-inch (127 mm) wide bearing surface for metal wall panels at the following locations:
 - 1) Horizontal Panel System: At typ. 5/8-inch vertical joints.
 - 2) Vertical Panel System: 4-1/2 inches at horizontal stack joints.
 - b. Backer Flash and Gasket. Provide minimum bearing surface for metal wall panels at the following locations:
 - 1) Horizontal Panel System: 3 inches wide at vertical joints.
 - 2) Vertical Panel System: 4-1/2 inches at horizontal stack joints.
 - c. Seal Plate and IMV Gasket: Provide minimum 6-inch (152 mm) wide bearing surface for metal wall panels at the following locations:

1.04 QUALITY ASSURANCE

- A. Manufacturer/Source: Provide metal wall panel system and panel accessories from a single manufacturer.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.
1. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years' experience with successfully completed projects of a similar nature and scope, and employing workers trained by manufacturer to install products of this Section.
- C. Testing Agency Qualifications: Qualify in accordance with requirements of ASTM E329.
- D. Mockups: Build mockup in size and location indicated. Show details of composite wall panel system. Demonstrate methods and details of installation. Show details of horizontal and vertical joints, penetrations, doors, windows, louvers, pipe openings, inside and outside corners, top and bottom of wall.
1. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.

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2. Approved mockup may become part of installation if approved by Architect.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct pre-installation meeting at site attended by Owner, Architect, manufacturer's technical representative, and other trade contractors.
 1. Coordinate building framing in relation to composite wall panel system.
 2. Coordinate windows, doors and louvers, and other openings and penetrations of composite wall panel system.

1.06 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products.
- B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized dealer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale 1-1/2-inch per foot of all required trim and extrusions needed for a complete installation.
 1. Indicate points of supporting structure that must coordinate with composite wall panel system installation.
- C. Samples for Initial Selection: For each product specified, provide product samples, representative color chips and/or charts of manufacturer's full range of colors.

1.07 INFORMATIONAL SUBMITTALS

- A. Manufacturer's warranty: Submit sample warranty.

1.08 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. A. Protect products of composite wall panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
 1. Deliver, unload, store, and erect composite wall panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

SECTION 074213 –METAL WALL PANELS

1.10 WARRANTY

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panel assemblies that fail in materials and workmanship within 2 years from date of Substantial Completion.
- B. Special Panel Finish Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace wall panels that display evidence of deterioration of finish within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Metal Wall Panel System: Aluminum Horizontal wall panel system.

2.02 MANUFACTURERS

- A. Basis of Design: CENTRIA, INTERCEPT Series Panel Wall Cladding System.
 - 1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944, Toll-Free: (800) 759-7474, Telephone: (412) 299-8000, Fax: (412) 299-8317, Email: info@CENTRIA.com, Website: www.CENTRIA.com.
 - 2. Or approved equal.

2.03 PANEL SYSTEM

- A. INTERCEPT ENTYRE, formed aluminum, back ventilated, rainscreen panel system.
- B. Material: 100 percent aluminum sheet, 0.060 inches thick. Formed into profiles.
- C. Exposed Coil-Coated Finish:
 - 1. Fluoropolymer Three-Coat System: 0.8 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, and a 0.8 mil 70 percent PVDF fluoropolymer clear coat, AAMA 621.
 - a. Basis of Design: CENTRIA Duragard Plus.
 - 2. Color: Match custom color – Sherwin Williams "Seattle Red."
 - 3. Exposed Trim and Fasteners: Match panel finish.

2.04 FORMED METAL WALL PANELS

- 1. ENTYRE Profile.
- 2. Panel Thickness: 1 3/8-inch flat.
- 3. Panel Width: As shown on Elevations. Custom widths indicated.
- 4. Panel Length: As shown on Elevations.

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5. Panel Profile: Flat.
6. Panel Reveals:
 - a. Horizontal Panels.
 - b. Reveal: 3/4-inch.

2.05 METAL WALL PANEL ACCESSORIES

- A. General: Provide complete metal wall panel assembly incorporating trim, copings, fascia, soffits, sills, factory formed inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed accessories for a complete installation. Fabricate accessories in accordance with SMACNA Manual.
- B. Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.
- C. Extrusion Trim: Provide manufacturer-provided extruded trim for the following locations and as indicated on Drawings:
 1. Base trim.
 2. Coping.
 3. Panel installation perimeter.
 4. Opening perimeters.
- D. Sealants: Type recommended by metal wall panel system manufacturer for application, meeting requirements of Section 079200, JOINT SEALANTS.
- E. Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching the color of metal wall panels by means of factory-applied coating.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine metal wall panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.
- B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.
 1. Maximum deviations acceptable:
 - a. 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
 - b. 1/2-inch (12.7 mm) from flat substrate on any building elevation.

SECTION 074213 –METAL WALL PANELS

- c. 1/8-inch in 5 feet (3.2 mm in 1.5 m).
- C. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.
- D. Openings: Verify that windows, doors, louvers and other penetrations match layout on shop drawings.
- E. Advise General Contractor of all out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel installation.
- F. Correct out of tolerance work and other deficient conditions prior to proceeding with panel installation.

3.02 METAL WALL PANEL SYSTEM INSTALLATION

- A. General: Install metal wall panel system in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement.
- B. Attach panels to substrate using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.
 - 1. Fasteners for Wall Panels: Stainless-steel for exterior locations and locations exposed to moisture; carbon steel for interior use only.
 - 2. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as approved by manufacturer.
 - 3. Fasten metal wall panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer. Install clips to supports with self-tapping fasteners.
 - 4. Provide escutcheons for pipe and conduit penetrating exterior walls.
- C. Horizontal Application:
 - 1. Horizontal Joinery: Working from bottom of initial installation to top, connect upper panel to lower panel.
- D. Dissimilar Materials: Where elements of metal wall panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.

SECTION 074213 –METAL WALL PANELS

3.03 ACCESSORY INSTALLATION

- A. General: Install metal wall panel accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install related flashings and sheet metal trim per requirements of Section 076200, SHEET METAL FLASHING AND TRIM.
 - 2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, fillers, closure strips, and similar items.
 - 3. Comply with performance requirements and manufacturer's written installation instructions.
 - 4. Provide concealed fasteners except where noted on approved shop drawings.
 - 5. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.04 CLEANING AND PROTECTION

- A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

END OF SECTION

SECTION 074243

VENTILATED COMPOSITE WALL PANELS AND SOFFITS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section Includes:
 - 1. Decorative high-pressure compact laminate panels mounted using the back ventilated rainscreen design principle.
 - 2. Panel fasteners and all trim accessories.
 - 3. Siding/soffit furring channels/supports and fasteners.

1.02 RELATED SECTIONS

- A. Section 072113, EXTERIOR RIGID INSULATION, backing support material for siding supports.
- B. Section 072726, FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIERS, fluid-applied membrane over exterior rigid insulation; waterproofing over rigid insulation.
- C. Section 076200, SHEET METAL FLASHING AND TRIM, flashing at openings and panel transitions.
- D. Section 084413, ALUMINUM-FRAMED ENTRANCES AND STOREFRONT SYSTEMS, ventilated composite systems adjacent to windows.
- E. Section 085113, ALUMINUM CLAD WINDOWS, ventilated composite systems adjacent to windows.
- F. Section 091000, METAL SUPPORT SYSTEMS, suspension system for composite panel soffit.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

SECTION 074243 – VENTILATED COMPOSITE WALL PANELS AND SOFFITS

1. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 2. ASTM D635, Standard Test Method for Small Scale Burning.
 3. ASTM D1929, Standard Test Method for Ignition Temperature.
 4. ASTM D2244, Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
 5. ASTM D2247, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 6. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 7. ASTM E119, Standard Test Method for Fire Rated or Fire Resistive Construction.
 8. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads.
- B. International Organization for Standardization (ISO):
1. ISO 105 A02-93, Tests for Color Fastness -- Part A02: Grey scale for assessing change in color.
 2. ISO 178, Determination of Flexural Properties.
 3. ISO 527-3, Determination of Tensile Properties.
 4. ISO 846, Evaluation of the Action of Organisms.
- C. National Fire Protection Association (NFPA):
1. NFPA 268, Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
 2. NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non- Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Submit plan, section, elevation, and perspective drawings necessary to describe and convey the layout, profiles, and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colors, patterns, and textures.

SECTION 074243 – VENTILATED COMPOSITE WALL PANELS AND SOFFITS

- D. Code Compliance: Documents showing product compliance with local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product. Alternate materials must be approved by the architect of record prior to the bid date.
- E. Engineering Calculations: Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.
- F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns. Please note that samples are only representative for color and pattern and not for thickness or edge finish. Metallic colors may also show a slight fluctuation in appearance do to the metal flake orientation from batch to batch.
- G. Verification Samples: For each finish product specified, two samples a minimum of 3.5 inches by 3.5 inches (89 mm by 89 mm) representing actual product, color, and patterns. Sample edges may vary from field panel edges.
- H. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section.
- I. CALGreen and LEED Submittals: Product Data Sheets and Declaration Statements showing compliance with CALGreen Code per 1.04.B.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All panel products specified in this section will be supplied by a single manufacturer with a minimum of 25 years' experience.
 - 1. Products covered under the Work listed in this Section are to be manufactured in an ISO 9001 certified facility.
 - 2. Products covered under the work listed in this Section are to be manufactured in an ISO 14001 Certified facility.
- B. Installer Qualifications: All products listed in this section are to be installed by an installing firm who can prove 3 years in business and exemplary workmanship. Installing firm must have evidence of installing rainscreen wall panel systems and is suitable for the execution of the work.
- C. Mock-Up: Provide a mock-up for evaluation of the product and application workmanship.
 - 1. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

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- D. Pre-Installation Meetings: Conduct pre-installation conference to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. During transportation, use stable, flat pallets that are at least the same dimension as the sheets.
 - 2. Materials shall be packaged to minimize or eliminate the possibility of damage during shipping. Items such as wooden side boards, wooden lid, and spacers or protective sheeting between panels shall be used to protect the panels from surface and/or edge damage.
- B. Storage:
 - 1. Store products in an enclosed area protected from direct sunlight, moisture, and heat. Maintain a consistent temperature and humidity.
 - 2. Store products in manufacturer's and/or fabricators unopened packaging until ready for installation.
 - 3. Stack siding/soffit boards using protective dividers to avoid damage to decorative surface.
 - 4. For horizontal storage, store siding/soffit boards on pallets of equal or greater size as the siding/soffit boards with a protective layer between the pallet and siding/soffit boards and on top of the uppermost sheet.
 - 5. Do not store siding/soffit boards vertically.
- C. Handling:
 - 1. Remove protective film within 24 hours of the panels being removed from the pallet.
 - 2. When moving siding/soffit boards, lift evenly to avoid dragging siding/soffit boards across each other and scratching the decorative surface.
 - 3. Remove all labels and stickers immediately after installation.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. Recorded measurements to be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

SECTION 074243 – VENTILATED COMPOSITE WALL PANELS AND SOFFITS

1.08 WARRANTY

- A. Warranty: At project closeout, provide manufacturer's limited warranty documentation and material data property sheet.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Trespa International B.V.; P.O. Box 110, 6000 AC Weert Wetering 20, 6002 SM Weert The Netherlands, Website: www.trespa.com.
- B. Acceptable Manufacturer's Representative: Trespa North America, Ltd.; 350 5th Avenue, Suite 4610, New York, NY 10118. ASD. Toll Free: (800) 4-TRESPA, Telephone: (858) 679-2090, Fax: (858) 679-9568. Email: info.northamerica@trespa.com, Website: <http://www.trespa.com/na>.
- C. Or approved equal.

2.02 WALL SIDING AND SOFFIT MATERIAL

- A. Solid Phenolic Wall Siding: Trespa Pura_NFC Flush Siding by Trespa International B.V. as represented by Trespa North America, Ltd.
 - 1. Material: Solid siding manufactured using a combination of high pressure and temperature to create a flat plank created from thermosetting resins, homogenously reinforced with natural fibers and an integrated decorative surface or printed décor.
 - 2. Siding/Soffit Size: 10 feet x 7.3 inches x 0.3 inches.
 - 3. Siding/Soffit Thickness: 5/16 inches (8 mm).
 - 4. Siding/Soffit Type: Single sided decorative.
 - 5. Siding/Soffit Decor: Wood Décor, PU02 Classic Oak.
 - 6. Siding/Soffit Core: Fire retardant (FR) Brown core.
- B. Mounting System:
 - 1. Flush Siding/Soffit System with starter support rail, flush siding outer corner profile and universal clips with SFS profile screw.
- C. Sub-Structure:
 - 1. Extruded Aluminum Z-Bar (Aluminum Z Bar – 2.50" x 1.25" x 1.50" x .125" Wall)
 - 2. Furring Channel affixed to insulation coverboard. Use Trespa standard universal fasteners for siding/soffit attachment.

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3. Sub-structure designed to withstand structural loading due to wind load and the dead load of the panel, painted as required to conceal behind the open joinery of the attachment system.
 4. Extrusions, battens, including corner closures, joint closures and vent screens, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.
- D. Fasteners (Concealed): Fasteners are non-corrosive. Use SFS profile screw. Where exposed fasteners are required, they shall be colored to match sidings.
- E. Accessories:
1. Extruded aluminum trim includes outside corners, starter support rail profiles and finish profiles.
 2. Color to match siding.

2.03 FABRICATION

- A. Siding/Soffit: Solid phenolic wall siding with no voids, air spaces or foamed insulation in the core material.
- B. Siding/Soffit Thickness: 5/16 inches (8 mm).
- C. Panel Bow = 2 mm/m (= 0.079 inch/39.38 inches).
- D. Siding/Soffit Dimensions: Field fabrication shall be allowed where necessary but shall be kept to a minimum. All fabrication shall be done under controlled shop conditions when possible.
- E. Appearance: Siding/Soffit lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Surfaces to receive siding/soffit shall be even, smooth, dry, and free from defects detrimental to the installation of the siding/soffit system. Notify Contractor in writing of conditions detrimental to proper and timely completion of the work.
- C. Confirm siding exterior sheathing is plumb and level, with no deflection greater than 1/4-inch (6 mm) in 20 feet (6,096 mm).

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- D. Confirm soffit suspension system is level allowing no deflection greater than 1/4-inch in 20 feet.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install solid phenolic wall siding, soffit and sub-frame system in accordance with manufacturer's instructions.
- B. Install solid phenolic wall and soffit siding plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals and drawings.
- C. Anchor panels and sub-framing securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary movement and structural support.
- D. Fasten solid phenolic wall and soffit siding with fasteners approved for use with supporting substrate.
- E. Do not install siding/soffit or component parts which are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.
- F. Do not cut or trim component parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance. Return component parts with require alteration to the shop for re-fabrication or replacement.
- G. Install profiles and trim with fasteners appropriate for use with adjoining construction as indicated on the Contract Drawings and as recommended by manufacturer.

SECTION 074243 – VENTILATED COMPOSITE WALL PANELS AND SOFFITS

3.04 ADJUSTING AND CLEANING

- A. Remove masking or panel protection as soon as possible after installation. Any masking intentionally left in place after plank installation on an elevation shall become the responsibility of the General Contractor to remove.
- B. Adjust final siding installation so that all joints are true and even throughout the installation. Siding out of plane shall be adjusted with the surrounding panels to minimize any imperfection.
- C. Protect installed siding and soffit in place. Clean finished surfaces as recommended by siding manufacturer.

END OF SECTION

SECTION 075423

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.01 Related Documents: Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. Furnish and install elastomeric sheet roofing system, including:
1. Roofing manufacturer's requirements for the specified warranty.
 2. Preparation of roofing substrates.
 3. Wood nailers for roofing attachment.
 4. Vapor barrier
 5. Insulation.
 6. Cover boards.
 7. Elastomeric membrane roofing.
 8. Metal roof edging, gutter and copings.
 9. Flashings.
 10. Walkway pads.
 11. Safety strips
 12. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

1.03 RELATED REQUIREMENTS

- B. Section 055200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for mechanical screen supports.
- C. Section 061000, ROUGH CARPENTRY. Wood nailers associated with roofing and roof insulation.
- D. Section 076200, SHEET METAL FLASHING AND TRIM. Formed metal flashing and trim items associated with roofing.
- E. Section 077200, ROOF ACCESSORIES. Roof hatches, vents, and manufactured curbs.
- F. Section 086200, UNIT SKYLIGHTS.

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- G. Section 118129, FACILITY FALL PROTECTION SYSTEMS, for integration of fall protection support into roofing system.
- H. Section 220000, PLUMBING, for roof drains.

1.04 REFERENCES

- I. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
 1. ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2010.
 2. ASTM C209, Standard Test Methods for Cellulosic Fiber Insulating Board; 2012.
 3. ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
 4. ASTM C1289, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
 5. ASTM C1549, Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2009.
 6. ASTM D638, Standard Test Method for Tensile Properties of Plastics; 2010.
 7. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2009.
 8. ASTM D1079, Standard Terminology Relating to Roofing and Waterproofing; 2013.
 9. ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2010.
 10. ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2008.
 11. ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
 12. ASTM D6878/D6878M, Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2011a.
 13. CAN-ULC-S770, Standard Test Method Determination of L-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams; 2009.
 14. FM DS 1-28, Wind Design; Factory Mutual System; 2007.
 15. FM DS 1-29, Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.
 16. PS 1, Structural Plywood; 2009.
 17. PS 20, American Softwood Lumber Standard; 2010.
 18. SPRI ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1).

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1.05 SUBMITTALS

- J. Product Data:
 - 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
 - 2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
 - 3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

- K. Shop Drawings: Provide:
 - 1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
 - 2. For tapered insulation, provide project-specific layout and dimensions for each board.

- L. Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.

- M. Executed Warranty.

- N. Specimen Warranty: Submit prior to starting work.

- O. Samples: Submit samples of each product to be used.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Roofing installer shall have the following:
 - 1. Current manufacturers roofing, wall, and lining systems Master Contractor status.
 - 2. At least 5 years' experience in installing specified system.

- B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
 - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
 - 2. Notify Architect well in advance of meeting.

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1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

1.08 WARRANTY

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Warranty: Manufacturers 30-year Platinum Red Shield™ Limited Warranty covering membrane, roof insulation, and membrane accessories.

Warranty Duration	Membrane Thickness, required minimums
30 years	Only 0.080 UltraPly Platinum TPO

- 1. Limit of Liability: No dollar limitation.
- 2. Scope of Coverage: Repair leaks in the roofing system caused by:
 - a. Ordinary wear and tear of the elements.
 - b. Manufacturing defect in Elevate roofing, wall, and lining systems brand materials.
 - c. Defective workmanship used to install these materials.
 - d. Damage due to winds up to 90 mph.
- 3. Not Covered:
 - a. Damage due to winds in excess of 90 mph.
 - b. Damage due to hurricanes or tornadoes.
 - c. Hail.
 - d. Intentional damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer – Roofing System: Elevate roofing, wall, and lining systems, Nashville, TN. www.holcimelevate.com.
 - 1. Roofing systems manufactured by others may be acceptable provided the roofing system is equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
 - a. Specializing in manufacturing the roofing system to be provided.
 - b. Minimum 10 years of experience manufacturing the roofing system to be provided.

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- c. Able to provide a no dollar limit, single source roof system warranty
 - d. ISO 9001 certified.
- B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.
- C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
- 1. Metal roof edging products by other manufacturers are not acceptable.
 - 2. Field- or shop-fabricated metal roof edgings are not acceptable.
- D. Substitution Procedures: See Instructions to Bidders.
- 1. Submit evidence that the proposed substitution complies with the specified requirements.

2.02 ROOFING SYSTEM DESCRIPTION

- A. Roofing System: Wood Deck, refer to Structural Drawings.
- B. Membrane: Thermoplastic Polyolefin (TPO) single-ply membrane.
- C. Thickness: As specified elsewhere
- D. Membrane Attachment: Mechanically fastened.
- E. Slope: As indicated on Documents
- F. Comply with applicable local building code requirements.
- G. Vapor Barrier over deck/deck cover:
- 1. Membrane: High density polyethylene sheet with SBS modified bitumen adhesive.
 - 2. Attachment: Self adhering.
- H. Insulation:
- 1. Thickness as indicated on Roof Plan.
 - 2. Maximum Board Thickness: 2 inches (50 mm); use as many layers as necessary; stagger joints in adjacent layers.
 - 3. Base Layer: Polyisocyanurate foam board, non-composite.
 - a. Attachment: Mechanical fastening.
 - 4. Top Layer: Tapered Polyisocyanurate foam board, non-composite.
 - a. Attachment: Mechanical fastening.
- I. Cover Board: High Density Polyisocyanurate Cover Board:
- 1. Thickness: 0.5-inch (12.7mm).
 - 2. R-Value: 2.5 based on ASTM C158 and C177 tests.
 - a. Attachment: Mechanical fastening.

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- J. Crickets and Saddles: Tapered insulation of same type as specified for top layer; slope as indicated.

2.03 TPO MEMBRANE MATERIALS

- A. Roofing Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D6878, with polyester weft inserted reinforcement and the following additional characteristics:
 1. Thickness: 0.080-inch (2.03 mm) plus/minus 10 percent, with coating thickness over reinforcement of 0.030-inch (0.76 mm) plus/minus 10 percent.
 2. Puncture Resistance: 415 lbf (1,868 N), minimum, when tested in accordance FTM 101C Method 2031.
 3. Solar Reflectance: 0.79 minimum, when tested in accordance with ASTM C1549.
 4. Color: White.
 5. Acceptable Product: UltraPly Platinum TPO by Elevate.
- B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.
- C. Curb Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches (457 mm) wide.
- D. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
 1. Thickness: 0.060-inch (1.52 mm) plus/minus 10 percent.
 2. Tensile Strength: 1550 psi (10.7 MPa), minimum, when tested in accordance with ASTM D638 after heat aging.
 3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D638 after heat aging.
 4. Tearing Strength: 12 lbf (53 N), minimum, when tested in accordance with ASTM D1004 after heat aging.
 5. Color: White.
 6. Acceptable Product: UltraPly TPO Flashing by Elevate roofing, wall, and lining systems.
- E. Tape Flashing: 5-1/2-inch (140 mm) nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065-inch (1.6 mm) nominal; TPO QuickSeam Flashing by Elevate roofing, wall, and lining systems.
- F. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Elevate roofing, wall, and lining systems.

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- G. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- H. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10-inch (2.5 mm) thick; Elevate Termination Bar by Elevate roofing, wall, and lining systems.
- I. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Elevate roofing, wall, and lining systems.
- J. General Purpose Sealant: EPDM-based, one-part, white general-purpose sealant; UltraPly TPO General Purpose Sealant by Elevate roofing, wall, and lining systems.
- K. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing by Elevate roofing, wall, and lining systems.
- L. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130-inch (3 mm) by 30 inches (760 mm) by 40 feet (12.19 m) long with patterned traffic bearing surface; UltraPly TPO Walkway Pads by Elevate roofing, wall, and lining systems.
- M. Yellow Safety Strip: To designate areas of caution on the roof or around rooftop objects. 5.5 inches wide (140 mm) by 100 feet long (30 m) strip and nominal 30 mil (0.76 mm) thick yellow TPO membrane laminated to a white, cured, seam tape. Compatible with TPO and EPDM; QuickSeam Yellow Safety Strip by Elevate roofing, wall, and lining systems.

2.04 VAPOR BARRIER

- A. Vapor Barrier Membrane: Comprised of SBS modified bitumen adhesive, factory-laminated to a tri-laminate woven, high-density polyethylene top surface. Release liner protecting adhesive.
 - 1. Intended for use as a direct to deck air/vapor barrier in roofing systems and may be used as a temporary roof membrane for up to 90 days.
 - 2. Thickness: 0.0325-inch (0.826 mm) minimum, when tested in accordance with ASTM D5147.
 - 3. Max Load at Break at 73 deg F (23 deg C): 64 lbf/in, MD (11 kN/m) 88 lbf/in, XMD (15 kN/m) when tested in accordance with ASTM D5147.
 - 4. Low Temperature Flexibility: -30 deg F (-34 deg C) when tested in accordance with ASTM D5147.
 - 5. Moisture Vapor Permeance, 0.02 Perms (0.92 Ng/Pa•s•m²) maximum, when tested in accordance with ASTM E96.
 - 6. Air Permeability: 0.00114 ft³/min•ft² (0.007 L/sec•m²) maximum, when tested in accordance with ASTM E2178.

SECTION 075423 – THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

- B. Acceptable Product: V-Force™ Vapor Barrier Membrane by Elevate roofing, wall, and lining systems.

2.05 ROOF INSULATION AND COVER BOARDS

- A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
 - 1. Thickness: As indicated elsewhere.
 - 2. Size: 48 inches (1,220 mm) by 96 inches (2,440 mm), nominal.
 - a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1,220 mm) by 48 inches (1,220 mm), nominal.
 - 3. R-Value (LTTR): 1.0-inch (25 mm) Thickness: 5.7 R, minimum.
 - 4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C1289.
 - 5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
 - 6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
 - 7. Acceptable Product: Flat and Tapered ISO 95+™ GL/ISOGARD GL polyiso board insulation by Elevate roofing, wall, and lining systems.
- B. High Density Polyisocyanurate Cover Board: Non-combustible, water-resistant high density, closed cell polyisocyanurate core with coated glass mat facers, complying with ASTM D1623, and with the following additional characteristics:
 - 1. Size: 48 inches (1,220 mm) by 96 inches (2,440 mm), nominal.
 - a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches (1,220 mm) by 48 inches (1,220 mm), nominal.
 - 2. Thickness: 0.5 inch (12.7mm).
 - 3. R-Value: 2.5 based on ASTM tests C158 and C177.
 - 4. Surface Water Absorption: <3 percent, maximum, when tested in accordance with ASTM C209.
 - 5. Compressive Strength: 120 psi, when tested in accordance with ASTM D621.
 - 6. Density: 5pcf, when tested in accordance with ASTM D1622.
 - 7. Mold Growth Resistance: Passed, when tested in accordance with ASTM D3273.
 - 8. Acceptable Product: ISOGARD HD Cover Board by Elevate roofing, wall, and lining systems.
- C. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

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2.06 METAL ACCESSORIES

- A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
1. Wind Performance:
 - a. Membrane Pull-Off Resistance: 100 lb/ft (1,460 N/m), minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition.
 - b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current edition.
 2. Description: Two-piece, 45-degree sloped galvanized steel sheet edge member securing top and bottom edges of formed metal fascia; Elevate EdgeGard™.
 3. Fascia Face Height: As shown on drawings.
 4. Edge Member Height Above Nailer: 1-1/4 inches (31 mm).
 5. Length: 144 inches (3,650 mm).
 6. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
 7. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
 8. Anchor Bar Cleat: 20-gauge, 0.036-inch (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes.
 9. Curved Applications: Factory modified.
 10. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
 11. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch (355 mm) long legs on corner pieces.
- B. Metal Gutter: Continuous metal member serving as termination of roof membrane and retainer for metal gutter; watertight with no exposed fasteners; mounted to gutter nailer.
1. Wind Performance:
 - a. Membrane Pull-Off Resistance: 100 lb/ft (1,460 N/m), minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition.
 - b. Gutter Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current edition.
 2. Description: One-piece, formed metal gutter; Elevate EdgeGard™.
 3. Gutter size and shape: As shown on drawings

SECTION 075423 – THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

2.07 ACCESSORY MATERIALS

- A. Wood Nailers: PS 20-dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
 - 1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
 - 2. Thickness: Same as thickness of roof insulation and as indicated on the drawings.

PART 3 - INSTALLATION

3.01 GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- D. Perform work using competent and properly equipped personnel.
- E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- F. Install roofing membrane only when surfaces are clean, dry, smooth, and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 deg F (15 to 25 deg C).
- G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
 - 1. Protect from spills and overspray from bitumen, adhesives, sealants, and coatings.
 - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.

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3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- I. Consult membrane manufacturer's instructions, container labels, and Safety Data Sheets (SDS) for specific safety instructions. Keep all adhesives, sealants, primers, and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment, and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.
- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.03 PREPARATION

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease, and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4-inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent seepage of foreign materials into building.

3.04 VAPOR BARRIER INSTALLATION

- A. All deck/deck cover substrates (except metal decks) must be primed prior to application. Use only primer supplied by membrane manufacturer.

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- B. Application can be made at ambient temperatures as low as 25 deg F (-4 deg C) as long as membrane has been stored in a heated area so that it will be between 50 deg F (10 deg C) and 100 deg F (38 deg C) at the time of application.
- C. Install with minimum 3-inch (76.2 mm) side laps and 6-inch (152.4 mm) end laps.
- D. Roll in with a 75-lb (34 kg) roller to fully mate each roll to substrate, including all lap areas.

3.05 INSULATION AND COVER BOARD INSTALLATION

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install insulation in a manner that will not compromise the vapor retarder integrity.
- C. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- D. Lay roof insulation in courses parallel to roof edges.
- E. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4-inch (6 mm). Fill gaps greater than 1/4-inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4-inch (6 mm).
- F. Mechanical Fastening: Using specified fasteners and insulation plates, engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer to achieve required warrantee..

3.06 SINGLE-PLY MEMBRANE INSTALLATION

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- D. Install membrane mechanically attached to the substrate using seam battens, fasteners, and edge securement as specified and as required by membrane manufacturers.

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- E. Mechanical Attachment: Install fasteners in the seams, covered by membrane.
 - 1. Lay out fasteners in compliance with FM Class specified in PART 2, as recommended by membrane manufacturer, and as indicated, whichever is most stringent.
 - 2. Properly engage fasteners in the deck with head flush with the countersunk portion of seam plate.

- F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than two in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
 - 1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
 - 2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.07 FLASHING AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
 - 1. Follow roofing manufacturer's instructions.
 - 2. Remove protective plastic surface film immediately before installation.
 - 3. Install water block sealant under the membrane anchorage leg.
 - 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
 - 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
 - 6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
 - 7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

- C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
 - 1. Use the longest practical flashing pieces.
 - 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.

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3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
 4. Provide termination directly to the vertical substrate as shown on roof drawings.
- D. Roof Drains:
1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
 2. Position membrane, then cut a hole for roof drain to allow 1/2-inch to 3/4-inch (12 mm to 19 mm) of membrane to extend inside clamping ring past drain bolts.
 3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
 4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
 5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
 2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1-inch (25 mm) clearance from penetration, sloped to shed water.
 3. Structural Steel Tubing: If corner radii are greater than 1/4-inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.

3.08 FINISHING AND WALKWAY INSTALLATION

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1-inch (25 mm) and maximum of 3 inches (75 mm) from each other to allow for drainage.
1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches (150 mm) on either side.
 2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

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3.09 FIELD QUALITY CONTROL

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e., not a salesperson).
- B. Perform all corrections necessary for issuance of warranty.

3.10 CLEANING

- A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.11 PROTECTION

- A. Where construction traffic must continue over finished roof membrane, provide durable protection, and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
- B. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- C. Section Includes:
 - 1. Formed galvanized sheet metal flashing, counterflashing, and trim concealed from view and not specified in other specification sections.
 - 2. Pre-finish sheet metal at roof edges and fascia; and as indicated on the drawings.
 - 3. Pre-finish aluminum tubes at window openings with attachment accessories.
- D. Related Sections:
 - 1. Section 054000, COLD-FORMED METAL FRAMING, for framing systems.
 - 2. Section 061000, ROUGH CARPENTRY, for exterior plywood sheathing.
 - 3. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING, for self-adhering underlayment and flashings as indicated on drawings.
 - 4. Section 072100, BUILDING INSULATION, for cavity wall insulation.
 - 5. Section 072113, EXTERIOR RIGID BOARD INSULATION.
 - 6. Section 072736, FLUID-APPLIED MEMBRANE AIR BARRIERS, for air barriers adjacent to flashings.
 - 7. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING, for installing pre-finished sheet metal flashing and trim integral with membrane roofing at roof edge.
 - 8. Section 079200, JOINT SEALANTS, for general requirements for field-applied sealants installed with sheet metal flashing and trim.
 - 9. Section 084413, ALUMINUM-FRAMED ENTRANCES AND STOREFRONT SYSTEMS, for flashing systems adjacent to storefront systems.
 - 10. Section 084400, GLAZED ALUMINUM CURTAINWALL SYSTEMS, for flashing systems adjacent to curtainwall systems.

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11. Section 220000, PLUMBING, and Division 23, Heating, Ventilation, and Air Conditioning, Sections for flashing requirements for mechanical and electrical equipment and penetrations.

1.02 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq.ft.: 90-lbf/sq.ft. perimeter uplift force, 120-lbf/sq.ft. corner uplift force, and 45-lbf/sq.ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.03 REFERENCED STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
- B. American Society for Testing and Materials (ASTM):
 1. ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 2. ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 3. ASTM A792, Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 4. ASTM B32, Specification for Solder Metal.
 5. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 6. ASTM C920, Specification for Elastomeric Joint Sealants.
 7. ASTM D1187, Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal (Reapproved 2002).
 8. ASTM D1970, Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

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9. ASTM D2244, Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
 10. ASTM D4214, Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
 11. ASTM D4397, Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
 12. ASTM D4586, Specification for Asphalt Roof Cement, Asbestos-Free.
 13. ASTM F2329, Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- C. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual for Architectural and Metal Products, Current Edition.
- D. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
1. SMACNA, Architectural Sheet Metal Manual, Current Edition.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
 6. Details of special conditions.
 7. Details of connections to adjoining work.
 8. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

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- D. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- E. Qualification Data: For qualified fabricator.
- F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- G. Warranty: Sample of special warranty.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Mock-up: Integrate building flashings, gutters, fascia and cornice into mock-up wall sample as necessary for a complete waterproofing system.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with City, Architect, City's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

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- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.01 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet – Field Painting: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality.
 - 2. Provide 24-gauge for miscellaneous flashings not exposed to view, unless otherwise indicated.
 - 3. Surface: Smooth, flat and mill phosphatized for field painting.
- C. Metallic-Coated Steel Sheet – Pre-Finished: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755.
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ50 coating designation, Grade 40; structural quality, with striated surface.
 - 2. Provide 14-gauge for fascia at roof edge.
 - 3. Provide 20 gauge for miscellaneous pre-finished flashing indicated on drawings.
 - 4. Exposed Coil-Coated Finish: 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- D. Color: Dark Bronze.

2.02 WATERPROOF MEMBRANE

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 deg F.

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3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
 - f. Or approved equal.
- B. Slip Sheet: Building paper, 3 lb/100 sq.ft. minimum, rosin sized.

2.03 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A153 or ASTM F2329 or Series 300 stainless steel.
- C. Solder for Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch-wide and 1/8-inch-thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.
- G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

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2.04 MANUFACTURED SHEET METAL TRIM

- A. Aluminum Tube.
 - 1. 1/8-inch extruded aluminum tube at windows.
 - 2. Provide end caps where ends are exposed.
 - 3. Fasten with Aluminum Z Clip, 1 1/2 Inch Clip Size, 3/16 Inch Projection, 5/8 Inch Lift-Off, Model MF625 by Monarch Metals, Inc or approved equal.
 - 4. Tube Finish: Dark bronze (to match fascia).

2.05 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4-inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

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2.06 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022-inch-thick.

2.07 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028-inch-thick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 WATERPROOF MEMBRANE INSTALLATION

- A. General: Install membrane as indicated on Drawings.
- B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

SECTION 076200 – SHEET METAL FLASHING AND TRIM

3.03 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4-inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant.

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2. When ambient temperature at time of installation is moderate, between 40 deg F and 70 deg F, set joint members for 50 percent movement each way.
 3. Adjust setting proportionately for installation at higher ambient temperatures.
 4. Do not install sealant-type joints at temperatures below 40 deg F.
 5. Prepare joints and apply sealants to comply with requirements in Section 079200, JOINT SEALANTS.
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 2. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
 3. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

3.05 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.

SECTION 076200 – SHEET METAL FLASHING AND TRIM

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.06 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond all wall openings.

3.07 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.
- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4-inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

SECTION 076200 – SHEET METAL FLASHING AND TRIM

3.09 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. This Section includes the following:
1. Roof hatch.
 2. Roof Hatch Safety Railing System.
 3. Ladder-up Safety Post.
- B. Related Sections include the following:
1. Section 054000, COLD FORMED METAL FRAMING, for access hatch framing.
 2. Section 055015, ACCESS LADDERS, for metal vertical ladders for access to roof hatches.
 3. Section 061000, ROUGH CARPENTRY, for roof sheathing, wood blocking, and wood nailers.
 4. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING, for low-slope roofing accessories.
 5. Section 076200, SHEET METAL FLASHING AND TRIM, for shop- and field-fabricated metal flashing and counterflashing, and miscellaneous sheet metal trim and accessories.
 6. Section 092900, GYPSUM BOARD, for hatch access finishes over framing.

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
1. ASTM A653-95: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 2. ASTM A780-93a: Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

SECTION 077200 – ROOF ACCESSORIES

3. ASTM A792-95: Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
4. ASTM C920-95: Specifications for Elastomeric Joint Sealants

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- D. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.08 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leak proof, weathertight, secure, and noncorrosive installation.

SECTION 077200 – ROOF ACCESSORIES

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers:

1. Products name or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the contractor.

B. Roof Hatch, Post-up and Safety Railing:

1. Bilco Co.: Type S with Bil-Guard 2.0 Safety Railing.
2. Dur-Red Products.
3. Milcor, Inc.
4. O'Keeffe's, Inc.
5. Or approved equal.

2.02 METAL MATERIALS

A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A755.

1. Galvanized Steel Sheet: ASTM A653, G90 coated.
2. Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements in AAMA 2604, except as modified below:
 - 1) Humidity Resistance: 1000 hours.
 - 2) Salt-Spray Resistance: 1000 hours.

SECTION 077200 – ROOF ACCESSORIES

2.03 MISCELLANEOUS MATERIALS

- A. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, 1-inch-thick.
- B. Wood Nailers: As specified in Section 061000, ROUGH CARPENTRY.
- C. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- D. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- E. Elastomeric Sealant: ASTM C920, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.04 ROOF HATCHES

- A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
 - 1. Loads: Fabricate roof hatches to withstand 40-lbf/sq.ft. external and 20-lbf/sq.ft. internal loads.
 - 2. Type and Size: Single-leaf lid for personnel access, 30 by 36 inches.
 - 3. Curb and Lid Material: Galvanized steel sheet, 0.079-inch-thick.
 - 4. Insulation: Cellulosic-fiber board.
 - 5. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
 - 6. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
 - 7. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
 - 8. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height tapered to match slope to level tops of units.
 - 9. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - 10. Ladder Safety Posts:
 - a. LadderUP® safety post Model LU2 as manufactured by The Bilco Company or approved equal.
 - b. Device shall be designed with a telescoping tubular section that locks automatically when fully extended.

SECTION 077200 – ROOF ACCESSORIES

- c. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Provide release mechanism to return post to closed position.
 - d. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.
 - e. Material and Finish: Steel tube, galvanized.
 - f. Install on fixed ladders below hatch covers.
11. Safety Guard
- a. Bil-Guard 2.0 Safety Railing System as Manufactured by The Bilco Company or approved equal.
 - b. Model Number RL2-S.
 - c. Posts and rails are to be 1-1/4-inch schedule 40 pipe in 6061 T6 aluminum alloy.
 - d. Curb mounting brackets and teardrop brackets are to be 6063 T5 aluminum extrusion.
 - e. Locking mechanism is to be cast aluminum with spring hinges.
 - f. All fasteners are type 316 stainless steel.
 - g. Roof hatch safety rail system shall satisfy the requirements of OSHA 29 CFR 1910.29 and meets OSHA strength requirements.
 - h. Finish shall be "safety yellow" powder coat paint finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 - 2. Verify dimensions of roof openings for roof accessories.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.

SECTION 077200 – ROOF ACCESSORIES

- C. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- D. Roof Hatch Installation:
 - 1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
 - 2. Attach safety railing system to roof hatch curb.
 - 3. Attach ladder safety posts to fixed ladders according to manufacturer's written instructions.
- E. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.03 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 077600
DECK PEDESTAL SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Adjustable deck pedestals and wood tiles.

1.02 RELATED SECTIONS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM) D1238-04, “Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.”
- B. ASTM D792-00, “Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.”
- C. ASTM D638-03, “Standard Test Method for Tensile Properties of Plastics.”
- D. ASTM D256-06, “Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.”
- E. ASTM D648-06, “Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.”

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.

SECTION 077600 – DECK PEDESTAL SYSTEM

2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Shop Drawings: Submit shop drawings detailing the installation methods. Coordinate placement with locations noted on the Contract Drawings.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. All primary products specified in this section will be supplied by a single manufacturer with a minimum of 10 years' experience.
- B. Installer Qualifications:
 1. The deck support system installer must have a minimum of 2 years proven construction experience, be capable of estimating and building from blueprint plans and details, determine elevations, and properly handle materials. All Work must comply with the Bison installation application procedures for deck support work specified herein.
- C. Special Considerations.
 1. The contractor assumes the responsibility for and must take into consideration the structural capability and adequacy of the structure to carry the dead and live load weight(s) involved, and that the density of any insulation is satisfactory to resist crushing and damaging the waterproofing membrane.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship
 1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship is approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store Deck Supports and system components with labels intact and legible.
- B. Inspect all delivered materials to insure they are undamaged and in good condition.
- C. Store and dispose of solvent-based materials such as construction adhesive, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

SECTION 077600 – DECK PEDESTAL SYSTEM

1.07 PROJECT CONDITIONS

- A. Perimeter Walls and Containment
 - 1. Pedestrian decks must be restrained by perimeter blocking or walls on all sides. Lateral movement greater than 1/8-inch not allowed.
 - 2. Heavy Roof Top Features. Flat bottom features such as planters and heavy benches require individual support that is in addition to the deck pedestal system. Confirm locations of heavy features before final installation.
 - 3. A minimum of one additional pedestal support must be installed for every 500 lbs (or portion thereof) of static loading. These additional support pedestals must be installed directly under the decking and evenly spaced immediately below the feature locations. One additional pedestal must be placed under corner of any rectangular feature.
 - 4. When installing planters, additional support is required under the center and corners of the cubes.
- B. For applications over roofing and waterproofing membranes a 12-inch x 12-inch piece of the same type of membrane shall be installed as a separate protection slip sheet underneath each pedestal.

1.08 DECKS OVER ROOFING AND WATERPROOFING

- A. Roof top applications:
 - 1. Roof Type 1: Common Insulation installed below Roof Membranes.
 - 2. Provide enlarged base that supports the pedestal to distribute the anticipated loaded weight of a pedestal over an enlarged area.

1.09 WARRANTY

- A. At project closeout manufacturer to provide to the Owner or Owners Representative, an executed copy of the manufacturer's standard document outlining the terms, conditions and limitations of their limited warranty against manufacturing defect for a period of 3 years.
- B. The Contractor warrants that his work will remain free from defects of labor and materials used in conjunction with his work in accordance with the General Conditions for this project or a minimum of 3 years.
- C. It is the responsibility of the Contractor installing the product listed in this section to coordinate warranty requirements with any related sections or adjacent Work. Notify the Architect immediately of any potential lapses or limitations in warranty coverage.

SECTION 077600 – DECK PEDESTAL SYSTEM

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Acceptable Manufacturer: Bison Innovative Products; 2395 West 4th Avenue, Denver, CO 80223. Toll Free: (800) 333-4234, Phone: (303) 892-0400. Fax: (303) 825-5988, Email: Sales@BisonIP.com, Website: www.BisonIP.com.
- C. Or approved equal.

2.02 APPLICATIONS/SCOPE

- A. Furnish and install a complete adjustable deck support system with a maximum cavity height of up to 1,250 lbs/pedestal:
1. Versadjust Deck Pedestals.
 2. Typical Height Range 2-1/4 inches by 36 inches,
 3. Weight Bearing 1,250 lbs/pedestal.
 4. FS:3 V-Series Pedestals:
 - a. Provide all parts and accessories required for a complete system.
 - b. Provide base pads to create a bearing surface not to exceed 20 lbs per square foot or as allowed by TPO roofing system specified.
- B. Bison Wood Tiles:
1. Wood Tile Weight Bearing Capacity 1,250 lbs/ per tile FS:3.
 2. Model: WT-IPE-48 Ipê Wood Tile (FSC Certified SCS-COC-002585).
 3. Dimensions: 47-7/8 inches x 23-7/8 inches x 1.69 inches nominal.
 4. Weight per tile: 48 lbs Weight per square foot: 6 lbs.
 5. Fire Rating: Class A – meets & exceeds ASTM E108-07a Spread of Flame Test.
 6. Color: Brown (Note: Tiles are a natural product and have variations in color and grain).
 7. Surface: Ribbed.

SECTION 077600 – DECK PEDESTAL SYSTEM

- C. Model: FS-1 Fastening Kit for Bison Wood Tile Wood Tile Fastening Kit:
 - 1. Model: FS1 Fastening Kit.
 - 2. Fastens Wood tiles to the pedestals without penetrating or damaging wood.
 - 3. Bison #B-PP-2025 FIB also contains galvanized metal pad.
 - 4. Contains 20 percent Post-industrial recycled material.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify all elevations, required pedestal heights and deck dimensions before commencing work.

3.02 PREPARATION

- A. Establish accurate lines, levels, and pattern.
- B. The substrate must be clean and free of projections and debris that could impair the performance of the pedestals or the total deck system.
- C. Decks Over Roofing and Waterproofing: Verify that installation conforms to Section 1.08 of this Specification.
- D. Deck materials used, pattern, grid layout, starting point, and finished elevation should be shown on plan view shop drawings which have been prepared and approved by the designer, installing contractor and/or owner.
- E. Once a starting point and the finished elevation of the deck surface have been determined, the support system elevation (finished elevation minus deck material thickness) is established and marked around the perimeter using a transit “torpedo” water level or laser leveling device.
- F. Precise measurements should be taken and deck area should be accurately defined. Mark off and square all outside edges with control lines (chalk lines or spray paint). Install two lines that are perpendicular to each other across the deck area. Continue to mark a grid of lines in both directions marking the location of each pedestal. To assure a square layout, use the control lines as references to periodically check the layout during installation.

SECTION 077600 – DECK PEDESTAL SYSTEM

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. As necessary, place a Floating Insulation Base (FIB) board or Floating Foundation Base (FFB) in the location on the grid of each pedestal.

3.04 DECK SUPPORT PLACEMENT AND FINAL ADJUSTMENT

- A. Deck supports and the deck surface panels must be placed per manufacturer's instructions and approved shop drawings.
- B. Pedestals are to be rotated for final slight adjustment when pedestals are fully loaded. Deck supports are to be leveled in each succeeding row as the installation proceeds.
- C. Additional sections of shims may be used and should be available for regular maintenance. Shims may be used in multiples, whole or segmented, and placed under the base or on top the pedestal to level the deck support.
- D. On Top of Pedestal: Use construction adhesive to adhere sections of shims. Construction adhesive is not required when using whole shims on top of a pedestal.
- E. Beneath a Pedestal: Use a small amount of construction adhesive to adhere sections of shims and/or whole shims to each other or to the pedestal. Unless specified to do so, DO NOT use construction adhesive to adhere pedestal or shims to insulation, roofing or waterproofing membrane.

3.05 PERIMETER CONTAINMENT

- A. Any area of a deck that is not restrained by a parapet or foundation wall must be 'boxed-in' and contained. The deck panels will move if all sides are not adequately restrained. Perimeter containment located at the outside of the deck must be installed to provide restraint. No movement should be allowed at the perimeter of the deck system greater than 1/8-inch.

3.06 FIELD QUALITY CONTROL

- A. Inspect often during installation to assure that grid spacer lines are being maintained in a straight and consistent pattern and that deck panels or pavers are level and not rocking.
- B. Confirm that deck pedestal height does not exceed the specified height for the V Series:

SECTION 077600 – DECK PEDESTAL SYSTEM

- C. 24 inches (610 mm) maximum pedestal height unless using the Bison Brace System.
- D. Unless otherwise specified in writing to allow for expansion, inspect to assure that all paver spacing between tiles and at perimeter containment does not exceed 1/8-inch. Particular attention should be made to assure that all pedestrian entry or access points to the deck are level and that the deck surface tiles are not randomly raised or uneven creating a tripping or safety hazard.

3.07 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.08 INSTALLATION – FINAL ACCEPTANCE

- A. Confirm the deck system is adequately blocked on all sides to contain the surface decking and related components.
- B. Confirm there is no more than 1/8-inch spacing between any deck panels and at all sides of the deck perimeter.
- C. Confirm there is no ballasting rock used to fill in any perimeter voids.
- D. Confirm there is no 'rocking' of deck panels as foot traffic is applied to the surface decking.
- E. All required spacer tabs are in place and visible.

END OF SECTION

SECTION 078100 – SPRAY APPLIED FIRE RESISTIVE MATERIALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 DEFINITIONS

- A. Spray Applied Fire Resistive Materials. Material or combination of fireproofing materials used to help retain the structural integrity of steel members by maintaining an effective thermal barrier to provide fire resistance rating as documented by listings from accredited test laboratories.

1.03 GENERAL DESCRIPTION OF THE WORK IN THIS SECTION

- A. Intumescent coatings applied to structural steel columns at fire barrier locations.
- B. Spray applied fire resistive materials at underside of entire second floor metal deck and supporting steel beams. Apply at required thickness to provide fire ratings as indicated on Code Sheets; provide 30MIN rating thickness minimum at all deck and structural steel areas unless noted otherwise. Provide 2HR rating above Generator room, 1-hour rating at underside of Elevator Equipment Room.
- C. Spray applied fire resistive materials at underside of both stairways. Provide 1-hour rated coating at stair supports and at underside of stair landings and landing supporting steel.

1.04 RELATED WORK OF OTHER SECTIONS

- A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
 1. Section 014000, QUALITY REQUIREMENTS.
 2. Section 033000, CAST-IN-PLACE CONCRETE.
 3. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.
 4. Section 055000, METAL FABRICATIONS.
 5. Section 078413, PENETRATION FIRESTOPPING.
 6. Section 078446, FIRE-RESISTIVE JOINT SYSTEMS.
 7. Section 092000, GYPSUM BOARD.

SECTION 078100 – SPRAY APPLIED FIRE RESISTIVE MATERIALS

1.05 REFERENCES

- A. Underwriters Laboratories Inc. (UL) Fire Resistance Directory.
- B. Test Requirements and Reference Standards:
 - 1. ASTM E119, “Standard Test Methods for Fire Tests of Building Construction and Materials.”
 - 2. ASTM E84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”
 - 3. ASTM D2240, “Standard Test Method for Rubber Property—Durometer Hardness.”
 - 4. ASTM D2794, “Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).”
 - 5. ASTM D4060, “Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.”
 - 6. ASTM D4541, “Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.”
 - 7. ASTM E329-09, “Standard Specification for Agencies Engaged in Construction Inspection and Testing.”
 - 8. National Fire Protection Association, NFPA 251.
 - 9. Underwriters Laboratories Inc. (UL) ANSI/UL263.
 - 10. Underwriters Laboratories of Canada (ULc) CAN/ULC S101-M.
 - 11. Association of the Wall and Ceiling Industry, AWCI Technical Manual 12-B, current edition.
- C. Building Codes: California Building Code (CBC).
- D. Industry References:
 - 1. Underwriters Laboratories (UL), www.ul.com.
 - 2. National Fireproofing Contractors Association (NFCA), www.nfca-online.org/.
 - 3. The Society for Protective Coatings (SSPC), www.sspc.org/.
 - 4. Association of the Wall and Ceiling Industry (AWCI), www.awci.org.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company responsible for the manufacture of fire protection materials with local direct technical employee(s) (as distinct from distributors or authorized agents) readily available at the project site. Intumescent coatings shall be manufactured under the follow-up services program of UL and bear the UL label (mark). Manufacturer’s technical representative to be on site during start of installation and be generally available on-site as requested during the application process.
- B. Installer Qualifications: Engage experienced Installer certified, licensed, or otherwise qualified by the intumescent coatings manufacturer as having the necessary training to install manufacturer's products, and otherwise have the

SECTION 078100 – SPRAY APPLIED FIRE RESISTIVE MATERIALS

experience and staff to properly perform the installation. Installer shall be trained by the intumescent coatings manufacturer's direct employee(s) (as distinct from distributors or authorized agents).

- C. Installation: Verify steel members have been properly prepared, including the use of a compatible primer, and install intumescent coatings in accordance with manufacturer's written recommendations published in their product technical literature and/or provided by manufacturer.
- D. Product Identification: Label packages (pail or bucket) with manufacturer name, product name, expiration date, freeze tag, UL label (mark).
- E. Special Inspection: Owner to employ a qualified independent inspection and testing agency to perform field quality control testing services in accordance with AWCi Technical Manual 12-B, local building code and Authority Having Jurisdiction requirements.
- F. Inspection and Testing Agency Qualifications: ASTM E329-09, "Standard Specification for Agencies Engaged in Construction Inspection and Testing" and AWCi Technical Manual 12-B.
- G. Field Constructed Mockups: Prior to installing intumescent coatings, Installer shall apply products specified for exposed applications to demonstrate aesthetic qualities and workmanship. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Location: As indicated on drawings.
 - 2. Extent of Mockups: Approximately 5 square feet of surface for each product indicated.
 - 3. Notify architect 1 week in advance of the dates and times when mockups will be built.
 - 4. Obtain architect's written acceptance of mockups before start of actual unit of work.
 - 5. Retain and maintain mockups during construction in undisturbed condition as a standard for judging completed units of work.
 - a. Accepted mockups in undisturbed condition at time of substantial completion may become part of completed unit of work.

1.07 SUBMITTALS

- A. Product data for each coating indicated in documents.
- B. Product certificates from manufacturer documenting intumescent coatings comply with specified requirements including those for fire test response characteristics and compatibility with adhesives, primers, and other surface coatings on substrates indicated to receive intumescent coatings.

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- C. Fire Resistance Rating Listings: UL, or other accredited testing agency indicating type and size of steel member to receive intumescent coatings and minimum dry thickness (mils) to achieve specified fire resistance rating.
- D. Qualification Data: Installer to demonstrate capabilities and experience on completed projects which are comparable in size and scope by providing the following information:
 - 1. Project location: City, State, and Country.
 - 2. Scope of work: project type, contract valuation.
 - 3. Completion date.
 - 4. Architect: firm and contact information.
 - 5. Owner: name and contact information.
- E. LEED Submittals:
 - 1. Product Data for Credit EQ c4.2: Low emitting materials – Adhesives and sealants, documentation including printed statement of VOC content.
 - 2. VOC content: 0 g/L according to EPA Method 24.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original, unopened packages with manufacturer's labels intact and legible.
- B. Install coatings prior to expiration date included on packaging. Properly discard expired product.
- C. Store coatings protected from direct sunlight and maintained at a temperature as specified by the manufacturer. The product must not be frozen or stored at freezing temperatures. Verify proper storage of material as indicated by the freeze indicator label attached to the pail. Identify and label material damaged due to improper storage, remove from Project site and properly discard.

1.09 PROJECT CONDITIONS

- A. Environmental Conditions:
 - 1. Do not install fire resistive materials when ambient or substrate temperatures are, or prior to full cure will be, outside the manufacturer's recommended installation temperatures, unless temporary protection and heating/cooling is provided to maintain temperatures within the prescribed range for the period specified by the manufacturer.
 - 2. Do not install fire resistive materials when relative humidity is outside the limits established by the manufacturer. Consult manufacturer to determine precautions that may be implemented to prevent condensation from forming on the steel during application of fireproofing.
 - 3. Do not install fire resistive materials when relative humidity exceeds 80 percent. Consult manufacturer to determine precautions that may be

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implemented to prevent condensation from forming on the steel during application of fireproofing.

- B. Ventilation: Ventilate areas where fire resistive materials will be installed by natural means or, where this is inadequate, forced air circulation during and after application until fireproofing dries thoroughly.

1.10 SEQUENCING

- A. Sequence and coordinate application of fire resistive materials with related work specified in other Sections to comply with the following requirements:
 1. Coordinate installation of fire resistive materials with other items of work that may interfere with proper installation of fire resistive materials.
 2. Do not begin applying fire resistive materials until clips, hangers, supports, and other welded connections have been installed. Fire resistive materials manufacturer must approve in writing any clips, hangers, supports or connections that may installed over coating using mechanical or adhesive devices.
 3. Provide temporary enclosures as necessary to prevent deterioration of intumescent fire resistive materials due to exposure to unfavorable environmental conditions.
 4. Take appropriate steps to avoid abrasion and other damage to the applied fire resistive materials during construction operations.
 5. Do not protect or conceal structural members to which fire resistive materials have been applied until each area has been inspected, tested, and corrections have been made to any deficient areas.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.

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2.02 FIREPROOFING – INTUMESCENT COATINGS

- A. Intumescent coatings: Factory mixed formulation consisting of a modified heavy bodied coating, water based, with inorganic reinforcing fibers (non-asbestos, non-fiberglass) for spray application. For use at concealed columns with restricted wall space or column covers.
- B. Products: Subject to compliance with requirements, provide the following:
 - 1. Hilti Fire Finish CFP-SP WB by Hilti, Inc., Phone: (800) 879-8000, Website: www.us.hilti.com, Phone: (800) 363-4458, www.hilti.ca.
- C. Physical Characteristics:
 - 1. Surface Burning Characteristics of Building Materials, ASTM E84 (UL 723, CAN/ULC-S102): Class A Rating.
 - a. Flame Spread: 0.
 - b. Smoke Development 45.
 - 2. Durometer Hardness, ASTM D2240: 96 Shore A.
 - 3. Impact Resistance, ASTM D2794: 93 in-lb.
 - 4. Abrasion Resistance, ASTM D4060: 0.140 g/1000 cycles.
 - 5. Adhesion, ASTM D4541: 507 psi.
- D. Or approved equal.

2.03 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Standard Durability SFRM (Interior Locations, Concealed Conditions except columns): Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Grace Construction Products; W.R. Grace & Co. -- Conn; Grace Construction Products; Monokote MK-6 Series
 - 2. Bond Strength: Minimum 200-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E736.
 - 3. Density: Not less than 15 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E605.
 - 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than 0.375 inch (9 mm).
 - 5. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 0.
 - 6. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E761.
 - 7. Corrosion Resistance: No evidence of corrosion according to ASTM E937.

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8. Deflection: No cracking, spalling, or delamination according to ASTM E759.
 9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
 10. Air Erosion: Maximum weight loss of 0.0 g/sq. ft. in 24 hours according to ASTM E859.
 11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.
 12. Finish: Spray-textured finish.
- B. High Durability SFRM [Interior Locations, Exposed Conditions): Manufacturer's standard, factory-mixed, Portland cement based dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Grace Construction Products; W.R. Grace & Co. – Conn; Grace Construction Products; Monokote Z-146, Grace Construction Products.
 2. Bond Strength: Minimum 10,000-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E736.
 3. Density: Not less than 40 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E605.
 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than 0.375 inch (9 mm).
 5. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 0.
 6. Compressive Strength: Minimum 500 lbf/sq. in. according to ASTM E761.
 7. Corrosion Resistance: No evidence of corrosion according to ASTM E937.
 8. Deflection: No cracking, spalling, or delamination according to ASTM E759.
 9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
 10. Air Erosion: Maximum weight loss of 0.0 g/sq. ft. (in 24 hours according to ASTM E859.
 11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21
 12. Finish: Skip-Troweled Finish

2.04 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency

SECTION 078100 – SPRAY APPLIED FIRE RESISTIVE MATERIALS

acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 - 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

2.05 AUXILIARY FIREPROOFING MATERIALS

- A. General: Provide auxiliary fireproofing materials that are compatible with intumescent coating products and substrates and are approved by UL or other accredited testing agencies acceptable to authorities having jurisdiction for use in the fire resistive designs indicated.
- B. Substrate Primers: For use on each different substrate, provide primer that complies with the following requirements:
 - 1. Primer approved in writing by manufacturer of intumescent coatings and applied in full compliance with the primer manufacturer's recommendations. Primer must be fully cured prior to installation of the intumescent coating.

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- C. Topcoats: Suitable for application over applied intumescent coatings; of type recommended in writing by intumescent coatings manufacturer for each fire resistance design.

PART 3 - EXECUTION

3.01 PREPARATION-INTUMESCENT COATINGS

- A. Cover other work subject to damage from fall out or overspray of intumescent coatings materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.
- B. Clean substrates of substances that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.
- C. Prime substrates except where compatible shop primer has been applied and is in satisfactory condition to receive intumescent coatings. Primer must be fully cured prior to applying intumescent coatings.
- D. Apply intumescent coatings: Protect intumescent coatings from rain, direct sunlight, high humidity, strong wind (with dirt, dust, or sand) during the application and drying phases. Do not apply an additional coat of intumescent coating until previous layer has fully cured.
- E. For applications visible upon completion of project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections that would telegraph through fire resistive products after application.

3.02 INSTALLATION, INTUMESCENT COATINGS

- A. Coordinate application of intumescent coatings with other construction to allow for proper application and minimize need to repair damage.
- B. Comply with intumescent coatings manufacturer's instructions for mixing materials, application procedures, and types of equipment used to convey and install products, as applicable to the particular conditions of installation and as required to achieve fire resistance ratings indicated.
- C. Coat substrates with primer and allow proper cure time prior to applying intumescent coatings as recommended by intumescent coatings manufacturer for material and application indicated.
- D. Apply intumescent coatings identical to mock-ups.

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- E. Apply intumescent coatings in thicknesses required to achieve fire resistance ratings designated for each condition.
- F. Provide a uniform finish complying with description indicated for type of material and matching finish approved for field erected mockup.

3.03 PREPARATION – SPRAY APPLIED FIRE RESISTIVE MATERIALS

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.04 APPLICATION– SPRAY APPLIED FIRE RESISTIVE MATERIALS

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

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- E. Spray-apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- I. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- J. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- K. Cure fireproofing according to fireproofing manufacturer's written recommendations.
- L. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- M. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.

3.05 FIELD QUALITY CONTROL

- A. Inspection and Testing Agency: Coordinate installation of fireproofing with owner's independent inspection and testing agency.
- B. Testing agency will promptly report test results in writing to the installer and architect.
- C. Remove and replace fire resistive materials where test results indicate that fireproofing does not comply with specified requirements for adhesion.

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- D. Additional Testing: Where fire resistive materials are removed and replaced or repaired, Owner's inspection and testing agency shall perform additional testing to determine compliance with specified requirements.

3.06 CLEANING, REPAIR, AND PROTECTION

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove product over spray and fall out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Cure fire resistive materials according to manufacturer's recommendations.
- C. Protect fire resistive materials from damage during construction.
- D. Repair or replace work that was not properly protected from damage during construction in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 078413

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Sections:
 - 1. Section 072100, BUILDING INSULATION, for non-fire-rated and fire rated insulation.
 - 2. Section 211000, FIRE SUPPRESSION SYSTEM, for fire-stopping of fire-suppression piping penetrations.
 - 3. Division 22, PLUMBING, and Division 23, HEATING, VENTILATING, AND AIR CONDITIONING, Sections for fire-stopping of duct and piping penetrations.
 - 4. Division 26, ELECTRICAL; Division 27, TELECOMMUNICATIONS; and Division 28, ELECTRONIC SAFETY AND SECURITY, Sections for fire-stopping of cable and conduit penetrations.

1.03 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire barriers and smoke barriers.
 - 2. Fire-resistance-rated horizontal assemblies including floor/ceiling assemblies.

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- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E814:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1.04 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E84-96a: Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E814-94b: Test Method for Fire Tests of Through-Penetration Fire Stops.
- B. Intertek Testing Services
 - 1. Directory of Listed Products, Per Current On-line Service Directory.
- C. Underwriters Laboratories Inc. (UL):
 - 1. Fire Resistance Directory, Per Current On-line Service Directory.

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1.05 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- D. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- E. Qualification Data: For Installer.
- F. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful

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performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- C. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- D. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 013100, PROJECT MANAGEMENT AND COORDINATION.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.09 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

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- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify City's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application in the Through-Penetration Firestop System Schedule at the end of Part 3 that are produced by one of the following manufacturers:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace, W.R. & Co. – Conn.
 - 3. Hilti, Inc. (specified)
 - 4. Johns Manville.
 - 5. Specified Technologies Inc.
 - 6. 3M; Fire Protection Products Division.
 - 7. Tremco; Sealant/Weatherproofing Division.
 - 8. USG Corporation.
 - 9. Or approved equal.

2.02 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.

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- b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
- c. Fire-rated form board.
- d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.03 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as “fill,” “void,” or “cavity” materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- J. Silicone Foams: Multi-component, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

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- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 2. Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

2.04 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's

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recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.03 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted.

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- B. Include the following information on labels:
 - 1. The words “Warning – Through-Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage.”
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

3.05 FIELD QUALITY CONTROL

- A. Inspecting Agency: City will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.06 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.07 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. See attached “SCHEDULES OF THROUGH PENETRATION FIRESTOP SYSTEMS” that follows after this Section.

END OF SECTION

**SECTION 078446
FIRE-RESISTIVE JOINT SYSTEMS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. This Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-wall joints.
 - 2. Head-of-wall joints.
 - 3. Wall-to-wall joints.
- B. Related Sections include the following:
 - 1. Section 072100, BUILDING INSULATION, for non-fire-rated fiberglass batt insulation.
 - 2. Section 078413, PENETRATION FIRESTOPPING, for systems installed in openings in fire-rated walls and floors.
 - 3. Section 079200, JOINT SEALANTS, for non-fire-resistive joint sealants.

1.03 PERFORMANCE REQUIREMENTS

- A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive

SECTION 078446 – FIRE-RESISTIVE JOINT SYSTEMS

Joint System Schedule at the end of Part 3, as determined by UBC Standard 26-9 and UL 2079.

1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
 2. OPL-Listed, Perimeter Fire-Barrier Systems: F-ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
- D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1.04 REFERENCED STANDARDS

- A. ICBO Evaluation Service, Inc.: ICBO ES AC30: Acceptance Criteria for Joint Systems
- B. International Conference of Building Officials: UBC Standard 26-9: Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
- C. Underwriters Laboratories Inc.
 1. UL 2079: Tests for Fire Resistance of Building Joint Systems (ANSI)
 2. Fire Resistance Directory, Current Edition.

1.05 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
- D. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

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- E. Qualification Data: For Installer.
- F. Field quality-control test reports.
- G. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Section 1.03, "Performance Requirements" Article:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per methods indicated in Section 1.03, "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multi-component materials.

SECTION 078446 – FIRE-RESISTIVE JOINT SYSTEMS

- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.09 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify City's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until City's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Products: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Fire-Resistive Joint System Schedule following this Section.

2.02 FIRE-RESISTIVE JOINT SYSTEMS

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

SECTION 078446 – FIRE-RESISTIVE JOINT SYSTEMS

- B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Section 1.03, "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

SECTION 078446 – FIRE-RESISTIVE JOINT SYSTEMS

3.03 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Section 1.03, “Performance Requirements” Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 FIELD QUALITY CONTROL

- A. Inspecting Agency: City will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.
- B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
 - 1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

SECTION 078446 – FIRE-RESISTIVE JOINT SYSTEMS

3.05 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion.
- C. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.06 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. See attached “SCHEDULES OF UL-2079 (DYNAMIC) JOINT FIRESTOP SYSTEMS” that follows after this Section.

END OF SECTION

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Latex joint sealants.
 - 3. Acoustical joint sealants.
 - 4. Refer to Joint Sealant Schedule at end of PART 3.
- C. Related Sections:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE, for concrete control and expansion joint filler and gaskets.
 - 2. Section 042200, CONCRETE MASONRY UNITS, for masonry control and expansion joint fillers.
 - 3. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for solid surfacing panels and countertops requiring sealant joints.
 - 4. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING, for joint sealants.
 - 5. Section 072726, FLUID-APPLIED MEMBRANE WATERPROOF MEMBRANE AND AIR BARRIER, for joint sealants.
 - 6. Section 076200, SHEET METAL FLASHING AND TRIM, for sheet metal joint sealants.
 - 7. Section 078446, FIRE-RESISTIVE JOINT SYSTEMS, for fire-resistive joint sealants.
 - 8. Section 088000, GLASS AND GLAZING, for glazing sealants.
 - 9. Section 092900, GYPSUM BOARD, for sealing perimeter joints.
 - 10. Section 095113, ACOUSTICAL PANEL CEILINGS, for sealing edge moldings at perimeters with acoustical sealant.
 - 11. Section 321001, SITE PAVING AND SURFACING, for sealing joints in exterior pavement, walkways, and curbing.

SECTION 079200 – JOINT SEALANTS

1.02 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C834-05, Specification for Latex Sealants.
 - 2. ASTM C919-02, Practice for Use of Sealants in Acoustical Applications.
 - 3. ASTM C920-05, Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1021-01, Practice for Laboratories Engaged in Testing of Building Sealants.
 - 5. ASTM C1087-00, Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
 - 6. ASTM C1193-05a, Guide for Use of Joint Sealants.
 - 7. ASTM C1247-98, Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids (Current Edition).
 - 8. ASTM C1248-06, Test Method for Staining of Porous Substrate by Joint Sealants.
 - 9. ASTM C1330-02, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 - 10. ASTM C1521-02a, Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
 - 11. ASTM E90-04, Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- B. Code of Federal Regulations (CFR):
 - 1. 40 CFR, Part 59, Subpart D-2016: National Volatile Organic Compound Emission Standards for Architectural Coatings.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.

- B. Product Data: For each joint-sealant product indicated.
 - 1. For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

- C. LEED Submittal:
 - 1. Product Data for Credit EQ 4.1: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

- D. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- E. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.

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3. Joint-sealant formulation.
 4. Joint-sealant color.
- F. Qualification Data: For qualified Installer.
- G. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- H. Product Test Reports:
1. Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
 2. Preconstruction Compatibility and Adhesion Test Reports (from sealant manufacturer, indicating the following):
 - a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. Warranties: Sample of special warranties.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.05 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

SECTION 079200 – JOINT SEALANTS

1.06 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

- B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: Not more than 250 g/L.
 - 2. Non-membrane Roof Sealants: 300 g/L.
 - 3. Single-Ply Roof Membrane Sealants: 450 g/L.
 - 4. Sealant Primers for Non-porous Substrates: Not more than 250 g/L.
 - 5. Sealant Primers for Porous Substrates: Not more than 775 g/L.
 - 6. Modified Bituminous Sealant Primers: 500 g/L.

- C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing

SECTION 079200 – JOINT SEALANTS

according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

- E. Colors of Exposed Joint Sealants: As selected by Engineer from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

- A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. Pecora Corporation; 301 NS.
 - d. Sika Corporation, Construction Products Division; SikaSil-C990.
 - e. Tremco Incorporated; Spectrem 1.
 - f. Or approved equal.
- B. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 890-SL.
 - b. Pecora Corporation; 300 SL.
 - c. Tremco Incorporated; Spectrem 900 SL.
 - d. Or approved equal.
- C. Mildew-Resistant, Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; 898.
 - b. Or approved equal.
- D. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 786 Mildew Resistant.
 - b. GE Advanced Materials – Silicones; Sanitary SCS1700.
 - c. Tremco Incorporated; Tremsil 200 Sanitary.

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- d. Or approved equal.

2.03 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.
 - e. Or approved equal.

2.04 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - c. Or approved equal.

2.05 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type B (bi-cellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible

SECTION 079200 – JOINT SEALANTS

joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Non-porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent non-porous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean, porous, joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by

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vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
 4. Clean non-porous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Non-porous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

SECTION 079200 – JOINT SEALANTS

- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations.

3.04 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

SECTION 079200 – JOINT SEALANTS

3.06 JOINT-SEALANT SCHEDULE

- A. Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Sealant Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Tile control and expansion joints.
 - c. Joints between different materials listed above.
 - d. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, pourable, traffic grade, neutral curing.
 - 3. Joint-Sealant Color: As selected by Engineer from manufacturer's full range of colors.

- B. Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Control and expansion joints adhered masonry veneer.
 - d. Joints in soffit material.
 - e. Joints between different materials listed above.
 - f. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - g. Control and expansion joints in ceilings and other overhead surfaces.
 - h. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
 - 3. Joint-Sealant Color: As selected by Engineer from manufacturer's full range of colors.

- C. Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Sealant Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, pourable, traffic grade, neutral curing.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- D. Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.

SECTION 079200 – JOINT SEALANTS

- d. Vertical joints on exposed surfaces of concrete masonry walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - f. Other joints as indicated.
2. Joint Sealant: Latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Sealant Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated.
 2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Sealant Locations:
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 2. Joint Sealant: Acoustical.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

DIVISION 08
OPENINGS

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
- B. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- C. Section Includes:
 - 1. Hollow-metal steel doors and frames at masonry and metal-framed exterior door openings.
 - 2. Hollow-metal steel doors and frames at masonry and metal framed interior door openings.
 - 3. Knocked down, site assembled pre-finished steel door frames at interior door openings.
 - 4. Knocked down, site assembled sidelight, borrowed light, transom, and full-bound access door frames where occurs.
- D. Related Sections:
 - 1. Section 054000, COLD-FORMED METAL FRAMING, for framing and blocking.
 - 2. Section 083113, ACCESS DOORS AND FRAMES, for metal access doors and frames.
 - 3. Section 081416, FLUSH WOOD DOORS, for wood doors installed in steel frames.
 - 4. Section 087100, DOOR HARDWARE, for door hardware for hollow metal doors.
 - 5. Section 088000, GLASS AND GLAZING, for glazed lites in wood and steel doors and frames.
 - 6. Section 099113, EXTERIOR PAINTING, and Section 099123, INTERIOR PAINTING, for field painting hollow metal doors and frames.
 - 7. Section 281300, ELECTRONIC ACCESS CONTROL, for integration of access control systems at doors and frames.

1.02 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

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- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
- C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.03 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. ANSI A250.4-01 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
 - 2. ANSI A250.6-97 Hardware on Steel Doors (Reinforcement – Application).
 - 3. ANSI A250.8-98 Recommended Specifications for Standard Steel Doors and Frames.
 - 4. ANSI A250.10-98 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/DHI A115 Series (ANSI A115.1-1990 through ANSI A115.18-1994): Specifications for Steel Door and Frame Preparation for Hardware.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A153-01a, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM A591-98, Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Application.
 - 3. ASTM A1008-01a, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 4. ASTM A1011-02, Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 5. ASTM C665-01, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 6. ASTM C1363-97, Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
 - 7. ASTM E136-99, Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degree Celsius.
 - 8. ASTM E329-00b, Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction.
 - 9. ASTM E548-94, Guide for General Criteria Used for Evaluating Laboratory Competence.
- C. Hollow Metal Manufacturers Association (HMMA); Division of National Association of Architectural Metal Manufacturers:
 - 1. HMMA 820-87 Hollow Metal Frames.
 - 2. HMMA 831-97 Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.

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- D. International Conference of Building Officials:
 - 1. CBC Standard 7-2-1997: Fire Tests of Door Assemblies.
 - 2. CBC Standard 7-4-1997: Fire Tests of Fire Window Assemblies.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual for Architectural and Metal Products, Current Edition.
- F. National Fire Protection Association (NFPA):
 - 1. NFPA 80-99 Fire Doors and Fire Windows (ANSI).
 - 2. NFPA 105-99 Installation of Smoke-Control Door Assemblies (ANSI).
 - 3. NFPA 252-99 Fire Test of Door Assemblies (ANSI).
 - 4. NFPA 257-00 Fire Test for Window and Glass Block Assemblies (ANSI).
- G. The Society for Protective Coatings (SSPC):
 - 1. SSPC-Paint 12-82 Paint Specification No. 12: Cold-Applied Asphalt Mastic (Extra Thick Film) (Revised 2000).
 - 2. SSPC-Paint 20-82 Paint Specification No. 20: Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") (Revised 1991).
 - 3. SSPC-SP 1-82 Surface Preparation Specification No. 1: Solvent Cleaning (Revised 2000).
 - 4. SSPC-SP 3-82 Surface Preparation Specification No. 3: Power Tool Cleaning (Revised 2000).
 - 5. SSPC-SP 6/NACE No. 3-00: Joint Surface Preparation Standard SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning.
- H. Steel Door Institute (SDI):
 - 1. SDI 105-98 Recommended Erection Instructions for Steel Frames.
 - 2. SDI 108-99 Recommended Selection and Usage Guide for Standard Steel Doors.
 - 3. SDI 117-00 Manufacturing Tolerances for Standard Steel Doors and Frames.
- I. Underwriters Laboratories Inc. (UL):
 - 1. UL 9-00, Fire Tests of Window Assemblies.
 - 2. UL 10B-97, Fire Tests of Door Assemblies.
 - 3. UL 10C-98, Positive Pressure Fire Tests of Door Assemblies.
 - 4. UL 1784-01, Air Leakage Tests of Door Assemblies.

1.04 SUBMITTALS

- A. General: Submit in conformance with General Requirements Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.

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- C. LEED Qualification
 - 1. LEED Credit MR4.1, MR4.2: Post-consumer and pre-consumer recycled material content.
 - 2. LEED Credit MR5.1: Location of manufacturer/proximity to project.
 - 3. EQc4.1: VOC – MSDS sheet for paint materials.
- D. Shop Drawings: In addition to requirements below, provide a schedule of steel doors and frames using same reference numbers for details and openings as those on Drawings:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details.
 - 3. Frame details for each frame type, including dimensioned profiles.
 - 4. Details and locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, accessories, joints, and connections.
 - 7. Details of glazing frames and stops showing glazing.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of steel door and frame.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain steel doors and frames through one source from a single manufacturer.
- C. Fire-Rated Door, Sidelight, and Transom Frame Assemblies:
 - 1. Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 - 2. Test Pressure: Test according to IBC Standard 7-2. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
- D. Fire-Rated, Borrowed-Light Frame Assemblies:
 - 1. Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to IBC Standard 7-4.
 - 2. Label each individual glazed lite.
- E. Smoke-Control Door Assemblies: Comply with IBC Standard 7-2.

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1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Store doors and frames under cover at Project site.
 - 1. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking.
 - 2. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
 - 3. If wrappers on doors become wet, remove cartons immediately.
 - 4. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.08 COORDINATION

- A. Coordinate installation of anchorages for steel frames.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
 - 2. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.

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2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the Contractor.

B. Steel Doors and Steel Welded Frames:

1. Ceco Door Products; an ASSA ABLOY Group Company.
2. CURRIES Company; an ASSA ABLOY Group Company.
3. Republic Builders Products Company.
4. Steelcraft; an Ingersoll-Rand Company.
5. Stiles, Steel Door and Window Company.
6. Or approved equal.

2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.
- D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A153.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching steel door frames of type indicated.
- G. Grout: Comply with ASTM C476, with a slump of 4 inches for steel door frames built into concrete or masonry, as measured according to ASTM C143.
- H. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000, GLASS AND GLAZING.

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- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.03 STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated.
 - 1. Comply with ANSI A250.8.
 - 2. Design: Flush panel.
 - 3. Core Construction:
 - a. Vertical steel-stiffener core that produces doors complying with ANSI A250.8.
 - b. Fire Door Core: As required to provide fire-protection ratings indicated.
 - c. Provide mineral-fiber insulation fill between steel stiffeners.
 - 4. Vertical Edges for Single-Acting Doors: Beveled edge, 1/8-inch in 2 inches.
 - 5. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 - 6. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.
 - 7. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors and Interior Doors in Masonry Openings:
 - 1. Face sheets fabricated from 14-gauge metallic-coated (galvanized) steel sheet.
 - 2. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 3. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), typical unless otherwise noted.
- C. Interior Doors (unless otherwise noted):
 - 1. Face sheets fabricated from 14-gauge cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements.
 - 2. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level.
 - 3. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), typical unless otherwise noted.
- D. Hardware Reinforcement:
 - 1. Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

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2. Hinges: Minimum 0.123-inch-thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than six spot welds.
 3. Pivots: Minimum 0.167-inch-thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than six spot welds.
 4. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067-inch-thick.
 5. All Other Surface-Mounted Hardware: Minimum 0.067-inch-thick.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.04 WELDED STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior Frames, Interior frames in Masonry Openings and Interior Frames in Wet Areas:
1. Fabricate from 14-gauge metallic-coated (galvanized) steel sheet.
 2. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
- C. Interior Frames:
1. Fabricate from 14-gauge cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
 2. Fabricate frames with mitered or coped and welded face corners and seamless face joints, unless otherwise indicated.
- D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
1. Hinges: Minimum 0.123-inch-thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than six spot welds.
 2. Pivots: Minimum 0.167-inch-thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than six spot welds.
 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067-inch-thick.
 4. All Other Surface-Mounted Hardware: Minimum 0.067-inch-thick.
- E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- F. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177-inch-thick.
 2. Metal-Wall Type: Designed to engage metal stud, welded to back of frames; not less than 0.042-inch-thick.

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- G. Floor Anchors: Formed from same material as frames, not less than 0.042-inch-thick, and as follows for Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- I. Plaster Guards: Formed from same material as frames, not less than 0.016-inch-thick.

2.05 KNOCK DOWN STEEL FRAMES

- A. Acceptable Manufacturers:
 - 1. Timely Industries, A Division of SDS Industries, Inc., 10241 Norris Avenue, Pacoima, CA, 91331-2292; Phone toll free: 800-247-6242; Fax: 818-492-3530. Web site: www.timelyframes.com.
 - 2. Stiles Steel Door and Window Systems.
 - 3. Or approved equal.
 - 4. Frames: Provide all interior frames for project from same manufacturer. Provide exterior frames as shown on plans
- B. Frames:
 - 1. Frame Material: Hot-dipped galvanized steel for all frames.
 - 2. Frame Throat Opening: As shown on plan details to suit finished wall thickness.
 - 3. All frames to be C or CK series (where fire ratings are required). CK series with kerf formed into frame profile with factory installed, pre-mitered smoke/sound control gasket.
 - 4. Frame Profile: Unequal Rabbet profile, standard with manufacturer.
- C. Side Light Frames:
 - 1. 18-gage with profile matching adjacent door frame. Verify glass dimensions for sidelights and borrowed lights.
- D. Casings:
 - 1. Provide aluminum casings formed to be applied to heat treated clips on frame face after frame is anchored to wall.
 - 2. Aluminum With Reveal: TA-23 with a 1/4-inch reveal with manufacturer's standard TA-24 corner alignment clips. Pre-finish casing to match frame.
- E. Frame Reinforcement and Accessories:
 - 1. Provide reinforcements shipped loose to project site for hardware application.
 - 2. TA-10: Regular arm closers, casing mounted coordinators.
 - 3. TA-12: Parallel arm closers, Rim Exit device strikes, other stop mounted surface hardware.

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4. TA-47: For CK frame, Parallel arm closers, Rim Exit device strikes, other stop mounted surface hardware.
5. TA-25: Double acting spring hinges, continuous hinges, other surface mounted hardware on door rabbet or cased opening frame.
6. Provide hinge reinforcement (TA-11) of 14 gage steel pierced to create depth of thread for hinge screws equal to or exceeding 7 gage steel.
7. Weatherstrip/Smoke Gasket: TA-46 (QDS500) 90-minute rated gasket for kerfed frames. All pieces' factory mitered to assure perfect corner alignment. Architect will select color from standard offerings.
8. Silencers: TA-5 vinyl, two per frame, clear stick-on type. Silencers not required on Kerfed frames or frames scheduled to receive stop mounted gasket or weatherstrip.
9. Glass Stops: TA-14 removable rolled steel, shape, butted ends. Pre-punch and countersink for flat head tek screws.
10. Adjustable strikes: Emboss frames for TA-1 strike for cylindrical lock. Provide TA-1 strike in finish compatible with hardware finish. (ANSI 2-3/4-inch T-strike supplied with cylindrical lock cannot be used with standard frame because of unique strike location and screw piercing method.)
11. Prepare frames for ASA 4-7/8-inch strikes where required. Provide minimum 1/4-inch depth of threads in factory tapped screw holes.
12. Interior Frames Attachment: #6 Drywall type length sufficient to penetrate studs or structure at least 1/2-inch.

F. Fabrication:

1. Openings for single swing, pair, borrowed light and sidelight frames to be pre-cut, notched, and fabricated at the manufacturer's facility. For fire-rated and exterior openings, provide kerf at stop for installation of smoke gasket or weatherstrip.
2. Provide minimum 14-gage hinge reinforcement plate tapped for machine screws supplied with hinges. Hinge plate to be mechanically attached to hinge emboss on frame.
3. Casing Clips: Fabricate frames with factory applied, heat treated clips to ensure no deflection in the clip upon application or removal of casing. Attachment clips may not be of same material as frame.
4. Provide notches, tabs and/or stops for positive alignment of frame parts at all corners.
5. Mullions to be notched as required to provide tight joints.
6. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts.
7. Provide manufacturer's standard steel glass stop pre-cut to exact length. Fire rated glazed openings to have hole for installation screw within 2 inches of each end of stop piece.
8. Provide insert channel full width of borrowed lights installed on finish floor. Provide full width head channel for ceiling height units.
9. Provide adequate structural support (by others) for ceiling insert channel for ceiling height frames.

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10. Transom bars to be fixed type with compatible profiles to jamb and head
11. Attach approved mylar label to each fire-rated frame indicating fire rating details
12. Factory install TA-46 smoke gasket on all pre-finished, CK series frames. Install with factory mitered corners to ensure adequate seal and pleasing appearance

G. Finishing:

1. Frame Units: Pre-finished with factory applied impact resistant polyester baked enamel finish. Architect to select from pre-matched custom colors (30 options).
2. Casing Finishes
 - a. Aluminum: Prefinished with factory applied impact resistant, polyurethane baked enamel finish.
3. Colors:
 - a. Architect to select from pre-matched custom colors (30 options).

H. Stops and Moldings:

1. Moldings for Glazed Lites in Metal Doors: Minimum 0.032-inch-thick, fabricated from same material as door face sheet in which they are installed.
2. Fixed Frame Moldings: Formed integral with steel frames, minimum 5/8-inch-high, unless otherwise indicated.
3. Loose Stops for Glazed Lites in Frames: Minimum 0.032-inch-thick, fabricated from same material as frames in which they are installed.

2.06 FABRICATION

- A. General: Fabricate steel doors and frames to be rigid and free of defects, warp, or buckle.
 1. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant.
 2. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Steel Doors:
 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Glazed Lites: Factory cut openings in doors.
 3. Door Louvers: Provide sight-proof stationary louvers for doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24-gauge galvanized steel set into minimum 20-gauge galvanized steel frame.
 - a. Provide insect screens at exterior doors.

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C. Welded Steel Frames:

1. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
5. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
6. Where installed in concrete and masonry and where shown for metal frames, leave vertical mullions in frames open at top for grouting.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry/Concrete Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches in height.
 - 2) Three anchors per jamb from 60 to 90 inches in height.
 - 3) Four anchors per jamb from 90 to 120 inches in height.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.
 - b. Metal Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches in height.
 - 2) Four anchors per jamb from 60 to 90 inches in height.
 - 3) Five anchors per jamb from 90 to 96 inches in height.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
 - 5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
9. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

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- b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100, DOOR HARDWARE.
 - 1. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware.
 - 2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings, such that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of doors and frames.
 - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.07 DOOR AND WELDED STEEL FRAME FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish steel door and frames after assembly.
- B. Metallic-Coated Steel Surface Preparation:
 - 1. Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
 - 2. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780.
 - 3. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Steel Surface Preparation:
 - 1. Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning;" remove dirt, oil, grease, or other contaminants that could impair paint bond.

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

2. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Factory Priming for Field-Painted Finish:
1. Apply shop primer specified below immediately after surface preparation and pretreatment.
 2. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
 3. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of steel doors and frames.
1. Examine roughing-in for embedded and built-in anchors to verify actual locations of steel frame connections before frame installation.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION – WELDED FRAMES

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16-inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

3.03 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Welded Steel Frames: Install steel frames for doors, sidelights, transoms, borrowed lights, and other openings, of size and profile indicated. Comply with SDI 105.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set.
 - 2. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - 3. At fire-protection-rated openings, install frames according to NFPA 80.
 - 4. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - 5. Install frames with removable glazing stops located on secure side of opening.
 - 6. Install door silencers in frames before grouting.
 - 7. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - 8. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 9. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.
 - 10. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
 - 11. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
 - 12. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames or apply bituminous coating to the backs of frames that are filled with mortar.
 - 1. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and concrete/masonry with mortar as specified in Divisions 03 and 04.
 - 13. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16-inch, measured at jambs at floor.

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

- C. Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Shim as necessary.
 - 2. Non-Fire-Rated Standard Steel Doors:
 - a. Jamb and Head: 1/8-inch plus or minus 1/16-inch.
 - b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8-inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4-inch.
 - 3. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 4. Smoke-Control Doors: Install doors according to IBC Standard 7-2.

- D. Knock-Down Frames and Lites
 - 1. Install frames in accordance with manufacturer's requirements.
 - 2. Anchor frames with screws located at every casing clip or every 11 inches as shown on manufacturer's instructions. Field-verify quantity and location of fasteners prior to installing casing.
 - 3. Install pre-finished frames near end of the project after wall painting and wall coverings are applied.
 - 4. Install frames using qualified installers familiar with installation of pre-finished drywall frames.
 - 5. Coordinate installation of glass and glazing in glazed units.
 - 6. Coordinate installation of frames with installation of hardware specified in Section 087100, DOOR HARDWARE, and doors in Section 081416, FLUSH WOOD DOORS.
 - 7. Touch-up blemishes on finished frames with factory prepared touch up paint.

- E. Glazing: Comply with installation requirements in Section 088000, GLASS AND GLAZING, and with steel door and frame manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments:
 - 1. Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition.
 - 2. Remove and replace defective work, including steel doors or frames that are warped, bowed, or otherwise unacceptable.

- B. Clean grout and other bonding material off welded steel doors and frames immediately after installation.

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

- C. Welded Frame Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- D. Welded Frame and Door Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Rated and non-rated solid-core panel doors with wood veneers for transparent finishing, factory finished.
 - 2. Stile and rail door with factory finish to match solid core panel wood doors with wood veneers.
 - 3. Stile and rail French doors with factory finish to match solid core panel wood doors with wood veneers.
 - 4. Factory fitting wood doors to frames and factory machining for hardware.
- C. Related Sections:
 - 1. Section 081113, HOLLOW METAL DOORS AND FRAMES, for preparation of wood door for hollow metal frames.
 - 2. Section 087100, DOOR HARDWARE, for entrance door hardware schedule and hardware general requirements.
 - 3. Section 088000, GLASS AND GLAZING, for glass view panels in French and flush wood doors.

1.02 REFERENCED STANDARDS

- A. Architectural Woodwork Institute:
 - 1. Architectural Woodwork Standards, Current Edition.
- B. Door and Hardware Institute (DHI):
 - 1. DHI A115-W (Various Dates): Wood Door Hardware Standards, Hardware Preparation.
 - 2. DHI-WDHS-3-96: Recommended Locations for Architectural Hardware for Wood Flush Doors.
- C. Window and Door Manufacturers Association (WDMA) (formerly National Wood Window and Door Association (NWWDA)):
 - 1. WDMA I.S.1-A-04: Architectural Wood Flush Doors.

SECTION 081416 – FLUSH WOOD DOORS

2. WDMA I.S.10-99: Specification for Testing Cellulosic Materials for Use in Fenestration Products.
3. WDMA TM-6-88: Test Method for Determining the Performance of Adhesive Bonds in Doors Under Accelerated Aging Conditions.

1.03 SUBMITTALS

- A. General: Submit in conformance with General Requirements Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 1. Indicate dimensions and locations of mortises and holes for hardware.
 2. Indicate dimensions and locations of cutouts.
 3. Indicate requirements for veneer matching.
 4. Indicate doors to be factory finished and finish requirements.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
 2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
 3. Frames for light openings, 6 inches long, for each material, type, and finish required.
- F. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush and rail and stile wood doors from single manufacturer.

SECTION 081416 – FLUSH WOOD DOORS

- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors," and "WI's "Manual of Millwork."
 - 1. Provide WI-Certified Compliance Certificate indicating that doors comply with requirements of grades specified.
 - 2. Provide WI-Certified Compliance Certificate for installation.
- C. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4-inch in a 42- by 84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01-inch in a 3-inch span.
 - 2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:

SECTION 081416 – FLUSH WOOD DOORS

1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the Contractor.

B. Wood Doors:

1. Algoma Hardwoods, Inc.
2. Marshfield Door Systems, Inc.
3. VT Industries Inc.
4. Or approved equal.

2.02 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. Quality Standard:
 1. Comply with NWWDA I.S.1-A, "Architectural Wood Flush Doors" and WI's "Manual of Millwork."
 2. Provide WI-Certified Compliance Certificate indicating that doors comply with the requirements of WI for Premium Grade.
 3. Provide WI-Certified Compliance Certificate for door installation.
- C. Structural-Composite-Lumber-Core Doors:
 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700-lbf.
 - b. Screw Withdrawal, Edge: 400-lbf.

2.03 VENEERED-FACED DOORS WITH FACTORY STAIN AND TRANSPARENT FINISH

- A. Interior Solid-Core Doors for Factory Stain and Transparent Finishing:
 1. Basis of Design: VT Industries Architectural Wood Doors “Heritage” or approved equal.
 2. Grade: WI Custom Grade.
 3. Face Veneer Species: Cherry.
 4. Factory Stain: Alpine Finish (AL07).
 5. Match between Veneer Leaves: Slip match.
 6. Assembly of Veneer Leaves on Door Faces: Center-balance match.

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7. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
8. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
9. Non-Rated Doors and Fire-Rated Doors: Specified wood veneer pressed over HDF Crossbanding over structural composite lumber.
10. Fire Rated: Provide mineral core for fire rated doors as noted on Door Schedule.
11. Construction: Five plies.

2.04 STILE AND RAIL DOOR WITH FACTORY STAIN AND TRANSPARENT FINISH

- A. Interior Solid-Core Doors for Factory Stain and Transparent Finishing:
 1. Basis of Design: VT Industries Architectural Wood Doors or approved equal.
 2. Grade: WI Custom Grade.
 3. Architectural Interior Stile and Rail Wood Doors: Eggers Stile & Rail Collection.
 4. Face Veneer Species: Cherry.
 5. Factory Stain: Alpine Finish (AL07).
 6. 3000 Series, Glass Panels.
 7. Panel Type: Glass and Cheery Wood Veneer.
 8. Door Thickness: 1-3/4 inches.
 9. Stile Width: 6 inches.
 10. Rails:
 - a. Top Rail Width: 6 inches, unless otherwise noted.
 - b. Bottom Rail Width: 10 inches.
 11. Stile Edge: Matching hardwood stile edge.
 12. Non-Rated Doors and Fire-Rated Doors: Specified wood veneer pressed over HDF Crossbanding over structural composite lumber.
 13. Sound Rated: Provide sound core for STC rated doors as noted on Door Schedule.
 14. Fire Rated: Provide mineral core for fire rated doors as noted on Door Schedule.
 15. Stile and Rail Joints: Doweled construction.
 16. Hinges and Face Plates: Factory drill pilot holes.
 17. Sticking Used with Glass: Square

2.05 LITE FRAMES

- A. Wood Beads for Lite Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
 1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular beads.

SECTION 081416 – FLUSH WOOD DOORS

2.06 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.

2.07 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Factory finish doors in accordance with approved sample sets for color and sheen.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
 - 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Doors for Transparent Finish:
 - 1. Factory finish doors in accordance with Finish Type: WDMA TR-8/AWS System 9 (UV Cured Acrylated Polyurethane).
 - 2. Factory finish shall be water based stain and infrared cured waterborne lacquer to comply with DPA Title 5 Guidelines for Volatile Organic Compound (VOC) emission limitations.
 - 3. Finish must meet or exceed performance standards of TR-3 waterborne lacquer.
 - 4. Provide Enviroclad UV finish system by Marshfield or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.

SECTION 081416 – FLUSH WOOD DOORS

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation, see Section 087100, DOOR HARDWARE.
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 083113

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls, ceilings, and soffits fire-rated and non-fire-rated.
- B. Related Sections:
 - 1. Section 054000, COLD-FORMED METAL FRAMING, for framing and blocking.
 - 2. Section 078413, PENETRATION FIRESTOPPING, for firestopping.
 - 3. Section 081113, HOLLOW METAL DOORS AND FRAMES, for hollow metal doors and frames.
 - 4. Section 087100, DOOR HARDWARE, for cylinder locks and master keying.
 - 5. Section 092900, GYPSUM BOARD, at access panels.
 - 6. Section 099113, EXTERIOR PAINTING, and Section 099123, INTERIOR PAINTING, for finishes at access panels.

1.03 REFERENCED STANDARDS

- A. ASTM International (ASTM):
 - 1. ASTM A36, Specification for Carbon Structural Steel.
 - 2. ASTM A123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. ASTM A591, Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications.
 - 5. ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

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6. ASTM A666, Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 7. ASTM A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 8. ASTM A786, Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
 9. ASTM A924, Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 10. ASTM A1008, Specifications for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 11. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
- B. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual for Architectural and Metal Products.
- C. National Fire Protection Association (NFPA):
1. NFPA 80: Fire Doors and Fire Windows.
 2. NFPA 252: Standard Method of Fire Tests for Door Assemblies.
- D. The Society for Protective Coatings (SSPC):
1. SSPC-SP 1: Surface Preparation Specification No. 1: Solvent Cleaning.
 2. SSPC-SP 5/NACE No. 1 2000: Joint Surface Preparation Standard SSPC-SP 5/NACE No. 1: White Metal Blast Cleaning.
 3. SSPC-SP 8 2000: Surface Preparation Specification No. 8: Pickling.
 4. SSPC-Paint 20: Paint Specification No. 20: Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- E. Underwriters Laboratories Inc. (UL):
1. UL 10B, Fire Tests of Door Assemblies.
 2. UL 263, Fire Tests of Building Construction and Materials.

1.04 SUBMITTALS

- A. General: Submit in conformance with General Requirements, Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- C. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

SECTION 083113 – ACCESS DOORS AND FRAMES

- E. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, fire-ratings, latching or locking provisions, and other data pertinent to installation.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for vertical access doors and frames.
- C. Size Variations: Obtain Engineer's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.06 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.01 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
 - 1. ASTM A123, for galvanizing steel and iron products.
 - 2. ASTM A153, for galvanizing steel and iron hardware.
- B. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A924.
- C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded

SECTION 083113 – ACCESS DOORS AND FRAMES

areas, and apply galvanizing repair paint specified below to comply with ASTM A780.

2. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pre-treating.

2.02 STAINLESS-STEEL MATERIALS

- A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
 1. Finish: Directional Satin Finish, No. 4.

2.03 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Dur-Red Products.
 2. J. L. Industries, Inc.
 3. Karp Associates, Inc.
 4. Larsen's Manufacturing Company.
 5. Milcor Inc.
 6. Or approved equal.
- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel and stainless-steel sheet as indicated.
 1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch-thick sheet metal, set flush with exposed face flange of frame.
 3. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
 4. Hinges: Spring-loaded, concealed-pin type.
 5. Latch: Cam latch operated by flush key with interior release.
 6. Lock: Cylinder.
- C. Exterior Flush Access Doors and Frames with Exposed Trim: Fabricated from stainless-steel sheet.
 1. Locations: Exterior wall and soffit surfaces.
 2. Door: Minimum 0.040-inch-thick flush panel construction with 2-inch-thick fiberglass insulation and weather-proof with extruded door gasket.
 3. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
 4. Hinges: Continuous piano, zinc plated.
 5. Lock: Dual-action handles with key lock.

SECTION 083113 – ACCESS DOORS AND FRAMES

- D. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel and stainless-steel sheet as indicated.
 - 1. Locations: Fire-rated wall and ceiling surfaces.
 - 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 - 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036-inch.
 - 5. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
 - 6. Hinges: Concealed-pin type.
 - 7. Automatic Closer: Spring type.
 - 8. Latch: Self-latching device operated by flush key with interior release.
 - 9. Lock: Self-latching device with cylinder lock.

2.04 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames:
 - 1. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 2. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
 - 3. Provide mounting holes in frames for attachment of units to metal or wood framing.
- D. Latching Mechanisms:
 - 1. Furnish number required to hold doors in flush, smooth plane when closed.
 - 2. For cylinder lock, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

SECTION 083113 – ACCESS DOORS AND FRAMES

- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.02 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.03 SCHEDULE OF ACCESS DOOR TYPES, FINISHES, AND LOCATIONS

- A. Provide fire-rated access doors and frames in fire-rated ceilings, on either side of fire-rated walls including corridors. Match fire rating of access doors to fire ratings of walls and ceilings penetrated.
- B. Door and Frame Finishes and Locations:
 - 1. Provide metallic-coated steel sheet access doors and frames with factory prime painted finish typically unless otherwise noted.
 - 2. Provide stainless steel sheet access doors and frames with No. 4 finish at exterior locations, at interior restrooms, kitchens, laundry rooms and other wet areas.

END OF SECTION

SECTION 083323
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. Section Includes:
1. Exterior overhead coiling insulated service door at Fitness room.
- B. Related Sections:
1. Section 055000, METAL FABRICATIONS, for miscellaneous steel supports.

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sf, acting inward and outward.
 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
1. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the emergency-egress-door component will be fully operational after the seismic event.”
 2. Seismic Component Importance Factor: 1.5.
- C. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door.

SECTION 083323 – OVERHEAD COILING DOORS

One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A653-05a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM B09-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM B221-05, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 4. ASTM E84-05e1, Test Method for Surface Burning Characteristics of Building Materials.
- B. International Code Council/American National Standards Institute (ICCI/ANSI):
 - 1. ICC/ANSI A117.1-2003, Accessible and Usable Buildings and Facilities (CABO).
- C. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual for Architectural and Metal Products, 1988 (ANSI).
- D. Structural Engineering Institute/American Society of Civil Engineers (SEI/ASCE):
 - 1. SEI/ASCE 7-2002: Minimum Design Loads for Buildings and Other Structures.
- E. U.S. Architectural & Transportation Barriers Compliance Board:
 - 1. Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities, adopted in 2004.

1.05 SUBMITTALS

- A. General: Comply with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
 - 1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Rated capacities, operating characteristics, and furnished accessories.
- C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

SECTION 083323 – OVERHEAD COILING DOORS

- D. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- E. Qualification Data: For qualified Installer.
- F. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.
- G. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

- A. Available Manufacturers:
 - 1. Products name or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the contractor.
- B. Exterior Insulated Coiling Steel Service Doors:
 - 1. Manufacturer: The Cookson Company, Inc., 1901 S. Litchfield Road Goodyear, AZ 85338, Telephone: (800) 294-4358.
 - 2. Door type as follows:
 - a. Type: Series ESD20 Chain Operated, Insulated Steel Service Doors.

SECTION 083323 – OVERHEAD COILING DOORS

- b. Mounting: Face-of -wall mounted, with full weatherstrip.
 - c. Finish: SpectraShield® Powder Coating, Custom Color.
 - d. Provide vision windows per drawings.
3. Or approved equal.

2.02 EXTERIOR SERVICE DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
- 1. Slat Type And Size: No. 45 (measuring 3 inches high by 7/8 inches deep), factory finished on both sides.
 - 2. Steel Door Curtain Slats: Interconnected strip steel slats zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A653, with G90 zinc coating; consisting of a 22-gauge exterior slat and a 22 gauge interior slat separated by 13/16-inch of rigid insulation.
 - 3. Insulation for Exterior Service Doors: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within slat faces.
 - 4. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.
 - 5. Vision Panels: 10- x 1-1/2-inch (254 x 41.28 mm) oval acrylic panes set with double sided foam glazing tape and secured with retaining clips and rivets. Maximum spacing is 6 inches horizontally between panels.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2- by 1-1/2- by 1/8-inch-thick; fabricated from manufacturer's standard hot-dip galvanized steel, factory finished to match curtain slats.
- D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

SECTION 083323 – OVERHEAD COILING DOORS

- E. Hood: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness.
 - 1. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face.
 - 2. Equip hood with intermediate support brackets as required to prevent sagging.
 - 3. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A653, factory finished to match curtain slats.
- F. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 - 1. At door head, use 1/8-inch-thick, replaceable, continuous sheet secured to inside of hood.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.
- G. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches high.
- H. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate, factory finished to match curtain slats.

2.03 OPERATION

- A. Manual Push-Up: Provide lift handles on bottom bar and pole with hook

2.04 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Provide cylinders specified in Section 087100, DOOR HARDWARE, and keyed to building keying system.
 - 2. Keys: Provide two for each cylinder.

2.05 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

SECTION 083323 – OVERHEAD COILING DOORS

- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03-in/ft of span under full load.
- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of cast iron or cold-rolled steel plate, factory finished to match curtain slats.

2.06 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish:
 - 1. Manufacturer's baked-on finish consisting of prime coat and thermosetting topcoat.
 - 2. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - 3. SpectraShield® Powder Coating – Custom Color Sherwin Williams "Seattle Red."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

SECTION 083323 – OVERHEAD COILING DOORS

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.03 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 083513
AUTOMATIC FOLDING DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. This Section includes four-fold metal doors with surface mounted tube frames.
- B. Operation of four-fold metal doors includes overhead mounted electro-mechanical operators.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.
- C. Submittal Drawings showing fabrication and installation of four-fold metal doors including plans, elevations, sections, details, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

1.04 QUALITY ASSURANCE

- A. Doors shall be designed to withstand external or internal horizontal wind loads of **120 mph (3-second gust) per ASCE 7-16**. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual."

SECTION 083513 - AUTOMATIC FOLDING DOORS

- B. Door manufacturer shall have at least 10 years' experience in manufacturing door type specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling.
- B. Handle materials carefully to prevent damage.

1.06 WARRANTY

- A. The door manufacturer shall provide a written standard limited warranty for material and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Four-fold industrial metal doors manufactured by Door Engineering and Manufacturing, 101 Power Dr, Mankato, MN 56001, Telephone: (800) 959-1352 or equal products by other manufacturers approved in advance.
 - 1. Model Number: FF300 Series: Glazed.

2.02 MATERIALS

- A. Steel Tube: ASTM A513 and ASTM A500/A500M.
- B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1008 cold-rolled steel sheet.
- C. Hardware: Manufacturer's standard components.
- D. Fasteners: Zinc-coated steel.

2.03 FOUR-FOLD DOORS

- A. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and

SECTION 083513 - AUTOMATIC FOLDING DOORS

square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8-inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

- B. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6 x 4 x 3/16-inch, designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports, and operator supports shall be factory attached.
- C. Factory finish: Door Panels and Tube Frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top-coat. Customer to select from Manufacturer's standard color chart or furnish sample to match.
 - 1. Operator and operating hardware shall be powder-coated manufacturer's standard gray.
- D. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.
 - 1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.
 - 2. Doors up to 16 feet wide and under 30 psf windload shall require no floor mounted supports, guides, or tracks.
 - 3. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.
- E. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum 3/4-inch diameter hardened steel.
- F. Hinge Guards: Provide plastic guards at jamb hinges to prevent access through hinge space.
- G. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16-inch cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping at sill shall include two 1/16-inch cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.
- H. Perimeter Weatherstripping: Provide jamb and head weatherstripping of 1/16-inch cloth-inserted neoprene bulb (or closed cell neoprene).

SECTION 083513 - AUTOMATIC FOLDING DOORS

- I. Vision Panels: Provide 1-inch insulated, tempered, vision panels of the size, shape and location as noted on the drawings.

2.04 OPERATOR

- A. Each four-fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.
- B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.
- C. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/230/480 VAC, 60 Hertz operation.
- D. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door and built in accordance with the latest NEMA standards. Incoming electrical shall be 208V 3phase.
 1. Control panel assemblies shall be UL listed as per NFPA70.
 2. Controls shall include a programmable logic controller with digital message display. Controller shall include programmable close timers and programmable inputs/outputs.
 3. Controls shall include a variable frequency drive with independent adjustment of the opening and closing speeds.
 4. Enclosures shall be NEMA 4 with disconnect switch.
 5. Pushbuttons (interior) for each door shall have one momentary pressure three-button push-button station marked "OPEN," "CLOSE," and "STOP." Push button enclosure shall be NEMA 4.
 6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
 7. Safety edges: Provide monitored electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
 8. Photo eyes: Provide one exterior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72 inches above floor.

SECTION 083513 - AUTOMATIC FOLDING DOORS

9. Presence Sensor: Provide one interior, overhead mounted, presence sensor BEA IS40P or equal. Doors over 16 feet tall shall include LZR-Widescan or equal.
10. Radio controls: Provide one radio receiver and one single button remotes per door. Remotes to open and close doors with single button.
11. **Option – Warning Horn/Strobe: Provide warning light and strobe. Include outputs PLC to allow for activation while door is in motion both opening and closing, along with activation prior to closing. Include programmable “delay-to-close” timer which activates the warning horn for a set time, prior to the door closing.**
12. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install four-fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.
- B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.02 ADJUSTING AND CLEANING

- A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.
- B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION

SECTION 084400

GLAZED ALUMINUM CURTAIN WALL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.

1.02 SUMMARY

- A. This Section covers:
1. Kawneer Architectural Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.
 2. Vent windows within the Curtain Wall System
 3. Exterior Sun Control Devices attached to the Curtain Wall system.
- B. Type of Kawneer Aluminum Curtain Wall Systems includes:
1. 1600 Wall System[®]5 Curtain Wall:
 - a. Sight line: 2-1/2 inches.
 - b. Inside glazed capture.
 - c. System depth: 7-1/2 inches.
- C. Type of Vent Window Includes:
1. GLASSvent[™] Windows (Operation per plan)
 - a. 2-13/16-inch (71.4 mm) system depth (1-inch Infill).
 - b. (P-HC40 – P-HC70) Project-Out Window.
- D. Types of Kawneer Sunshades include:
1. Versoleil[™] Horizontal Single Blade SunShade compatible with 1600 Wall System[™]5 Curtain Wall.
- E. Related Sections:
1. Section 079200, JOINT SEALANTS.
 2. Section 084413, ALUMINUM-FRAMED ENTRANCES AND STOREFRONT SYSTEMS.
 3. Section 088000, GLASS AND GLAZING.

SECTION 084400 – GLAZED ALUMINUM CURTAIN WALL SYSTEM

1.03 DEFINITIONS

- A. For fenestration industry standard terminology and definitions, refer to the American Architectural Manufacturers Association Glossary (AAMA AG-13).

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance:
 - 1. Product to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of glazed aluminum curtain walls representing those indicated for this project.
 - 2. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 3. Failure includes any of these events:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Loosening or weakening of fasteners, attachments, and other components.
 - d. Failure of operating units.
- B. Delegated Design:
 - 1. Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind Loads:
 - 1. The curtain wall system shall include anchorage that is capable of withstanding the following wind load design pressures:
 - a. Basic Wind Speed: 110-mph.
 - b. Exposure C.
 - c. The design pressures are based on the California Building Code, 2019 Edition.
- D. Air Leakage:
 - 1. The test specimen shall be tested in accordance with ASTM E283.
 - 2. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.2 psf (300 Pa).
- E. Water Resistance:
 - 1. Static:
 - a. The test specimen shall be tested in accordance with ASTM E331.
 - b. There shall be no leakage at a minimum static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.

SECTION 084400 – GLAZED ALUMINUM CURTAIN WALL SYSTEM

2. Dynamic:
 - a. The test specimen shall be tested in accordance with AAMA 501.1.
 - b. There shall be no leakage at an air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
- F. Uniform Load:
 1. A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction in accordance with ASTM E330.
 2. There shall be no deflection in excess of L/175 of the span of any framing member at design load.
 3. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2 percent of their clear spans shall occur.
- G. Seismic:
 1. When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 x the story height and ultimate displacement (inelastic) of 1.5 x the design displacement.
- H. Incidental Water Management Option:
 1. Head member shall be capable of directing condensation within the spandrel cavity to the exterior.
- I. Thermal Transmittance (U-factor), Physical Test:
 1. Thermal transmittance test results in accordance with AAMA 1503 or CSA A440 are based upon 1-inch (25.4 mm) clear insulating glass (1/4-inch, 1/2-inch AS, 1/4-inch).
 2. Captured: When tested using AAMA 1503, the U-factor shall not be more than 0.74 Btu/(hr·ft²· deg F).
 3. SSG: When tested using AAMA 1503, the U-factor shall not be more than 0.62 Btu/(hr·ft²· deg F).
- J. Condensation Resistance Factor (CRF):
 1. Condensation resistance test results in accordance with AAMA 1503 or CSA A440 are based upon 1-inch (25.4 mm) clear insulating glass (1/4-inch, 1/2-inch AS, 1/4-inch).
 2. Captured: When tested using AAMA 1503, the CRF_{frame} and CRF_{glass} shall not be less than 61 and 59, respectively.
 3. SSG: When tested using AAMA 1503, the CRF_{frame} and CRF_{glass} shall not be less than 71 and 62, respectively.
- K. Sound Transmission Loss:
 1. When tested to ASTM E90 and ASTM E1425, the Sound Transmission Class (STC) and Outdoor/Indoor Transmission Class (OITC) shall not be less than:
 - a. STC 32 or OITC 28 based upon 1-inch (25.4 mm) insulating glass (1/4-inch, 1/2-inch AS, 1/4-inch).

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- b. STC 37 or OITC 31 based upon 1-inch (25.4 mm) laminated glass (1/4-inch laminated, 1/2-inch AS, 1/4-inch laminated).
- L. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.05 SUBMITTALS

- A. Product Data:
 - 1. For each type of product indicated, include:
 - a. Construction details.
 - b. Material descriptions.
 - c. Dimensions of individual components and profiles.
 - d. Finishes.
 - 2. Recycled Content:
 - a. Provide documentation that aluminum has a minimum of 50 percent mixed pre- and post-consumer recycled content.
 - b. Provide a sample document illustrating project-specific information that will be provided after product shipment.
 - c. After product has shipped, provide project-specific recycled content information:
 - 1) Indicate recycled content, including the percentage of pre- and post-consumer recycled content per unit of product.
 - 2) Indicate the relative dollar value of recycled content product to the total dollar value of product included in the project.
 - 3) Indicate the location for recovery of recycled content.
 - 4) Indicate the location of the manufacturing facility.
 - 3. Environmental Product Declaration (EPD):
 - a. Include a Type III Product-Specific EPD created from a Product Category Rule.
- B. Shop Drawings:
 - 1. Plans.
 - 2. Elevations.
 - 3. Sections.
 - 4. Full-size details.
 - 5. Attachments to other work.
- C. Calculations stamped and signed by an engineer licensed to perform work in the State of California and with direct knowledge of the curtainwall systems.
- D. Samples for Initial Selection:
 - 1. Provide samples for units with factory-applied color finishes.
- E. Samples for Verification:
 - 1. Provide a verification sample for each type of exposed finish required, in manufacturer's standard sizes.

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- F. Product Test Reports:
 - 1. Provide test reports for glazed aluminum curtain walls.
 - 2. Test reports must be based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency.
 - 3. Test reports must indicate compliance with performance requirements.

- G. Fabrication Sample:
 - 1. Provide a fabrication sample of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12-inch (304.8 mm) lengths of full-size components and showing details of the following:
 - a. Joinery.
 - b. Glazing.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer must have successfully installed the same or similar systems required for the project and other projects of similar size and scope.

- B. Manufacturer Qualifications:
 - 1. Manufacturer must be capable of fabricating glazed aluminum curtain walls that meet or exceed the stated performance requirements.

- C. Source Limitations:
 - 1. Obtain aluminum curtain wall system through one source from a single manufacturer.

- D. Mockups:
 - 1. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 2. Build mockups for the type of curtain wall elevation indicated, with integral sun-shade system included in the mock-up.

- E. Pre-installation Conference:
 - 1. Conduct conference at project site to comply with requirements in Section 013100, PROJECT MANAGEMENT AND COORDINATION.

1.07 PROJECT CONDITIONS

- A. Field Measurements:
 - 1. Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication.
 - 2. Indicate measurements on shop drawings.

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1.08 WARRANTY

- A. Submit manufacturer's standard warranty for owner's acceptance.
- B. Warranty Period:
 - 1. Two years from Date of Substantial Completion of the project provided however that in no event shall the Limited Warranty begin later than 6 months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Curtainwall System Basis-of-Design Product:
 - 1. Kawneer Company, Inc.
 - 2. 1600 Wall System®5 Curtain Wall types:
 - a. 1600 Wall System®5 Curtain Wall:
 - 1) Sight line: 2-1/2 inches (63.5 mm).
 - 2) Inside glazed capture.
 - 3) System depth: 7-1/2 inches (190.5 mm).
 - 3. Tested to AAMA 501.
- B. Or approved equal.

2.02 MATERIALS

- A. Aluminum Extrusions:
 - 1. Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish.
 - 2. Not less than 0.070-inch (1.8 mm) wall thickness at any location for the main frame.
 - 3. Complying with ASTM B221: 6063-T6 alloy and temper.
 - 4. Recycled Content:
 - a. Shall have a minimum of 50 percent mixed pre- and post-consumer recycled content.
 - b. Indicate recycled content, including the percentage of pre- and post-consumer recycled content per unit of product.
 - c. Indicate the relative dollar value of recycled content product to the total dollar value of product included in the project.
 - d. Indicate the location for recovery of recycled content.
 - e. Indicate the location of the manufacturing facility.
- B. Aluminum Sheet Alloy:
 - 1. Shall meet the requirements of ASTM B209.

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- C. Fasteners:
 - 1. Aluminum, nonmagnetic stainless steel, or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.
- D. Anchors, Clips, and Accessories:
 - 1. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating.
 - 2. Anchors, clips, and accessories shall provide sufficient strength to withstand the design pressure indicated.
- E. Reinforcing Members:
 - 1. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating.
 - 2. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.
- F. Sealant:
 - 1. For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- G. Thermal Improvement:
 - 1. Vertical and horizontal covers shall utilize rigid PVC thermal isolator clips.
- H. Tolerances:
 - 1. References to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.03 CURTAIN WALL FRAMING

- A. Framing Members:
 - 1. Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads
 - 2. Glazing System: Four-sided captured.
 - 3. Glazing Plane: Back.
- B. Glass:
 - 1. 1-inch (25.4 mm) insulating glass, refer to specification Section 088000, GLASS AND GLAZING.
- C. Brackets and Reinforcements:

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1. Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.
- D. Framing Sealants:
 1. Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.
- E. Fasteners and Accessories:
 1. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials.
 2. Where exposed, fasteners and accessories shall be stainless steel.
- F. Perimeter Anchors:
 1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- G. Packing, Shipping, Handling, and Unloading:
 1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- H. Storage and Protection:
 1. Store materials so that they are protected from exposure to harmful weather conditions.
 2. Handle material and components to avoid damage.
 3. Protect material against damage from elements, construction activities, and other hazards before, during, and after installation.

2.04 GLAZING

- A. Glazing to meet requirements in Section 088000, GLASS AND GLAZING.
 1. Inside Glazed.
- B. Glazing Gaskets:
 1. Gaskets to meet requirements of ASTM C864.
- C. Spacers and Setting Blocks:
 1. Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape:
 1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants:
 1. As recommended by manufacturer for joint type.

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2.05 OPERABLE UNITS

- A. Exterior Aluminum Windows:
 - 1. GLASSvent UT™ Windows (Outswing Casement, Per Plan).
 - a. 2-13/16-inch (71.4 mm) system depth (1-inch Infill).
 - b. (P-HC40 – P-HC70) Project-Out Window.
 - 2. Hardware.
 - a. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
 - b. Project-Out/Outswing Casement Windows: Provide the following operating hardware:
 - 1) Stainless Steel 4-Bar Hinges.
 - 2) Cast White Bronze Cam Locking Handles.
 - 3) Pivot-shoe Roto Operator.
 - 3. Accessories.
 - a. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
 - b. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
 - c. Sealants and joint fillers for joints at perimeter of window system as specified in Section 079200, JOINT SEALANTS.
 - d. Insect Screens: Extruded aluminum frames, 6063-T6 alloy and temper, joined at corners: 18 x 16 mesh fiberglass screen cloth; frames finished to match aluminum windows; splines shall be extruded vinyl, removable to permit rescreening.
 - 4. Finish: #40 DARK BRONZE, typical all units.

2.06 SUNSHADE SYSTEM

- A. Basis-of-Design Product:
 - 1. Versoleil™ Single Blade Horizontal Sunshade, 6inch deep Versoleil™ Single Blade Horizontal Sunshade by Kawneer Company Inc. Length and spacing as shown on drawings.
- B. Materials
 - 1. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall and storefront system manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070 inches (1.8 mm) wall thickness at any location for the main frame and complying with ASTM B221: 6063-T6, 6105-T5, or 6061-T6 alloy and temper.

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- C. Recycled Content: Shall have a minimum of 50 percent mixed pre- and post-consumer recycled content.
 - 1. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 - 2. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
 - 3. Indicate location recovery of recycled content.
 - 4. Indicate location of manufacturing facility.

- D. Thermal Barrier: When applied on a thermally broken compatible system, sunshade shall be thermally isolated from the interior aluminum mullions by a nominal 0.25-inch-thick (6.3 mm) low conductance material.
 - 1. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.
 - 2. Sealant: For sealants required within fabricated sunshade system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
 - 3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall and storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.07 SUNSHADES

- A. Sunshade Members: Manufacturer's extruded or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads and custom shapes.

- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.

- C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

- D. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

- E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle sunshade materials and components to avoid damage. Protect sunshade materials against damage from elements, construction activities, and other hazards before, during and after installation.

2.08 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.

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2.09 FABRICATION

- A. Extrude or form aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations
 - 2. Accurately fitted joints
 - 3. Physical and thermal isolation of glazing from framing members
 - 4. Accommodations for thermal and mechanical movements of glazing and framing that maintain required glazing edge clearances
 - 5. Fasteners, anchors, and connection devices that are concealed from view to the greatest extent possible
 - 6. Internal weeping system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior
- C. Curtain Wall Framing:
 - 1. Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.
- D. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

2.10 ALUMINUM FINISHES

- A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing: custom wood like powder coat finish by Archi-Texture Finishing. <https://afusa.net>.
- C. Color: Dark Bronze

PART 3 - EXECUTION

3.01 EXAMINATION

- A. With installer present, examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B. Proceed with installation only after correcting unsatisfactory conditions.

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3.02 INSTALLATION

- A. Curtain Wall System Installation:
 - 1. Install curtain wall systems plumb, level, and true to line, without warp or rack of frames, within manufacturer's prescribed tolerances, and complying with installation instructions.
 - 2. Provide support and anchor in place.
 - 3. Dissimilar Materials:
 - a. Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
 - 4. Glazing:
 - a. Glass shall be Inside-glazed.
 - b. Glass shall be held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners that are spaced no more than 9 inches (228.6 mm) o.c.
 - 5. Water Drainage
 - a. Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations.
 - b. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.
- B. Related Products Installation:
 - 1. Sealants (Perimeter):
 - a. Refer to Section 079200, JOINT SEALANTS.
- C. Glass:
 - 1. Refer to Section 088000, GLASS AND GLAZING.
 - 2. Reference: ANSI Z97.1, CPSC 16 CFR 1201, and GANA Glazing Manual.

3.03 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter-caulked, and cured.
 - 2. Conduct tests for air infiltration and water penetration with manufacturer's representative present.
 - 3. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
 - 4. Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
 - 5. Air Infiltration Tests:
 - a. Conduct tests in accordance with ASTM E783.

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- b. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
- 6. Water Infiltration Tests:
 - a. Conduct tests in accordance with ASTM E1105.
 - b. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).
- B. Manufacturer's Field Services:
 - 1. Upon owner's written request, provide periodic site visit by manufacturer's field service representative.
- C. Adjusting, Cleaning, and Protection
 - 1. Adjusting: Not applicable.
- D. Protection:
 - 1. Protect installed product's finish surfaces from damage during construction.
 - 2. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- E. Cleaning:
 - 1. Repair or replace damaged installed products.
 - 2. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
 - 3. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
 - 4. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 084413

ALUMINUM-FRAMED ENTRANCES AND STOREFRONT SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section Includes:
 - 1. Exterior aluminum-framed entrance doors and glazed storefront wall systems incorporating 1-inch-thick glazed-insulated units.
 - 2. Glazed Storefront Windows incorporating 1-inch-thick glazed-insulated units.
 - 3. Operable windows incorporating 1-inch-thick glazed-insulated units within Storefront Systems.
 - 4. Provide calculations and shop drawings for storefront wall systems exceeding 10 feet in height for submittal to Building Department for Deferred Approvals.
- C. Related Sections:
 - 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for metal jamb assemblies at windows.
 - 2. Division 07, Thermal and Moisture Protection, for Air Barrier and Sheet Waterproofing Systems.
 - 3. Section 079200, JOINT SEALANTS, for installation of joint sealants installed with glazed aluminum storefronts and for sealants to the extent not specified in this Section.
 - 4. Section 087100, DOOR HARDWARE, for entrance door hardware schedule and hardware general requirements.
 - 5. Section 088000, GLASS AND GLAZING, for insulated glazed units, spandrel coatings, and general glass and glazing requirements.

1.02 PERFORMANCE REQUIREMENTS

- A. General: Provide glazed aluminum storefront system that has the specified capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
 - 1. Provide system that withstands loads and thermal and structural movement requirements indicated without failure. Failure includes the following:

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2. Air infiltration and water penetration exceeding specified limits.
 3. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. System Requirements:
1. Glazing shall be physically and thermally isolated from framing members.
 2. System shall be re-glazable from the exterior.
- C. Wind Loads:
1. Provide glazed aluminum storefront system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of the 2019 California Building Code and authorities having jurisdiction and as follows:
 - a. Basic Wind Speed: 110-mph.
 - b. Exposure C.
- D. Air Leakage: The test specimen shall be tested in accordance with ASTM E283. Air Leakage rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.2 psf (300 Pa) with interior seal or rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 1.6 psf (75 Pa) without interior seal. CSA A440 Fixed Rating.
- E. Uniform Load: A static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2 percent of their clear spans shall occur.
- F. Seismic: Provide glazed aluminum storefront system, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of California Building Code and local regulations or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent
- G. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
- a. Temperature Change (Range): 0 deg F (-18 deg C); 180 deg F (82 deg C).
 - b. Test Interior Ambient-Air Temperature: [75 deg F (24 deg C)].
 - c. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum three cycles.
- H. Deflection of framing members in a direction normal to wall plane is limited to 1/240 of clear span, or 3/4-inch, whichever is smaller, unless otherwise indicated.

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- I. Static-Pressure Test Performance:
 - a. Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E330.
 - b. Test Pressure: 150 percent of inward and outward wind-load design pressures.

- J. Dead Loads: Provide glazed aluminum storefront system members that do not deflect an amount that will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
 - 1. Provide a minimum 1/8-inch clearance between members and top of fixed glazing, or other fixed part immediately below.
 - 2. Provide a minimum 1/16-inch clearance between members and operable windows and doors.

- K. Live Loads: Provide glazed aluminum storefront system, including anchorage that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

- L. Water Penetration:
 - 1. Provide glazed aluminum storefront system that does not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 12-lbs/sq. ft.
 - 2. Water leakage is defined as follows: According to AAMA 501.1.

- M. Structural Support Movement: Provide glazed aluminum storefront system that accommodates structural movements including, but not limited to, sway, twist, column shortening, long-term creep, and deflection.

- N. Average Thermal Conductance: Provide glazed aluminum storefront system with an average U-value of not more than 0.66 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.

- O. Dimensional Tolerances: Provide glazed aluminum storefront system, including anchorage that accommodates dimensional tolerances of building frame and other adjacent construction.

- P. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:
 - 1. Glass to Exterior – 38 (STC) and 31 (OITC).

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1.03 REFERENCED STANDARDS

- A. American Architectural Manufacturers Association (AAMA):
1. AAMA 501.1-05, Standard Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure.
 2. AAMA 501.2-03, Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
 3. AAMA 501.5-05, Test Method for Thermal Cycling of Exterior Walls.
 4. AAMA 506-00 (Current Edition), Voluntary Specifications for Hurricane Impact and Cycle Testing of Fenestration Products.
 5. AAMA 611-98, Voluntary Specification for Anodized Architectural Aluminum.
 6. AAMA 701-00, Voluntary Specifications for Pile Weather-Stripping.
 7. AAMA 1503-98, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- B. American Society for Testing and Materials (ASTM):
1. ASTM A36-05, Specification for Carbon Structural Steel.
 2. ASTM A123-02, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 3. ASTM A153-04, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 4. ASTM A240-05, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 5. ASTM A1008-04b, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 6. ASTM A1011/-04a, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 7. ASTM B209-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 8. ASTM B221-05, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 9. ASTM B308-02, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 10. ASTM B429-02, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 11. ASTM C920-02, Specification for Elastomeric Joint Sealants.
 12. ASTM C1184-00a, Specification for Structural Silicone Sealants.
 13. ASTM C1401-02, Guide for Structural Sealant Glazing.
 14. ASTM D2000-04, Classification System for Rubber Products in Automotive Applications.
 15. ASTM E90-04, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

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16. ASTM E283-04, Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
 17. ASTM E330-02, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 18. ASTM E331-04, Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 19. ASTM E413-04, Standard Classification for Rating Sound Insulation.
 20. ASTM E699-03, Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.
 21. ASTM E783-02, Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.
 22. ASTM E1105-00, Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.
 23. ASTM E1332-9 (Current Edition), Standard Classification for Determination of Outdoor-Indoor Transmission Class.
 24. ASTM E1886-05, Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
 25. ASTM E1996-05, Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- C. American Society of Civil Engineers (ASCE):
1. ASCE 7-93, Minimum Design Loads for Buildings and Other Structures.
- D. American Welding Society (AWS):
1. AWS A5.10-99, Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.
 2. AWS D1.2-03, Structural Welding Code – Aluminum.
- E. Builders Hardware Manufacturers Association (BHMA):
1. BHMA A156.1-00, Butts and Hinges (ANSI).
 2. BHMA A156.3-01, Exit Devices (ANSI).
 3. BHMA A156.4-00, Door Controls – Closers (ANSI).
 4. BHMA A156.5-01, Auxiliary Locks & Associated Products (ANSI).
 5. BHMA A156.6-01, Architectural Door Trim (ANSI).
 6. BHMA A156.8-00, Door Controls - Overhead Stops and Holders (ANSI).
 7. BHMA A156.16-02, Auxiliary Hardware (ANSI).
 8. BHMA A156.21-01, Thresholds (ANSI).
- F. U.S. Architectural & Transportation Barriers Compliance Board:
1. Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities. 2013 Edition.

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- G. Flat Glass Marketing Association (FGMA):
 - 1. Glass Association of North America, Glazing Manual, Topeka, KS: GANA, Current Edition.
- H. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual for Architectural and Metal Products. Current Edition.
- I. The Society for Protective Coatings (SSPC):
 - 1. SSPC-Paint 12 1982 Paint Specification No. 12: Cold-Applied Asphalt Mastic (Extra Thick Film).
- J. Underwriters Laboratories (UL):
 - 1. UL 305-97, Panic Hardware.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit for each product specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
 - 1. Manufacturer's Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- C. LEED Submittal: Product Data for Credit EQ 4.1: For adhesives and sealants used inside of the weatherproofing system, including printed statement of VOC content.
- D. Shop Drawings: Submit showing fabrication and installation of glazed aluminum curtain wall system including plans, elevations, sections, details of components, and attachments to other units of Work.
- E. Submittal shall include the following:
 - 1. Structural design and structural calculations for the aluminum-framed storefront system; including calculation for the worst load combination, DL + Seismic or DL + Wind Loads.
 - 2. Show anchorage details (fastener size and spacing) of door/storefront wall (size, spacing, embedment length) to structural members at head, jambs and sills.
 - 3. Provide connection of Header and King Studs to structural beams and columns.

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4. Design of member profiles and component sizes for mullions, jambs, headers, and sills.
 5. Provide material (aluminum and other metal) properties, mullion and cross member profile and thickness and sectional properties (A , t_{min} , I_x , I_y , S_x , S_y) on the shop drawings.
 6. Provide connection details; specify screw types and properties (corrosion resistance, threads per inch, and length).
 7. Provide stress and deflection calculation ($<L/240$ for wind).
 8. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified California licensed professional engineer responsible for their preparation.
 9. Distinguish between factory and field assembly work.
- F. Samples for Verification: Submit of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
1. Cutaway Sample: Submit of each vertical-to-horizontal intersection of system, made from 12-inch lengths of full-size components and showing details of the following:
 - a. Joinery.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
- G. Quality Assurance Submittals:
1. Welder certificates indicating that welders comply with requirements specified in "Quality Assurance" Article.
 2. Installer certificates signed by manufacturer certifying that installers comply with requirements in "Quality Assurance" Article.
 3. Preconstruction test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance with performance requirements of glazed aluminum storefront system.
 4. Field test reports from a qualified independent inspecting and testing agency indicating and interpreting test results relative to compliance with performance requirements of glazed aluminum storefront system.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Engineer's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

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- B. **Installer Qualifications:** Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing glazed aluminum storefront systems similar to those required for this Project and who is acceptable to manufacturer.
- C. **Single Source Responsibility:** Retain the same subcontractor for installation, fabrication, and engineering responsibility.
- D. **Engineering Responsibility:** Engage a qualified professional engineer to prepare or supervise the preparation of data for glazed aluminum storefront systems, including drawings, testing program development, test-result interpretation, and comprehensive engineering analysis that shows systems' compliance with specified requirements.
 - 1. **Professional Engineer Qualifications:**
 - a. A structural engineer licensed in the State of California and who is experienced in providing engineering services of the kind indicated.
 - b. Engineering services are defined as those performed for installations of glazed aluminum storefront systems that are similar to those indicated for this Project in material, design, and extent.
 - 2. Prepare data for glazed aluminum storefront systems, including drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- E. **Source Limitations:** Obtain each type of glazed aluminum storefront system from one source and by a single manufacturer.
- F. **Welding Standards:**
 - 1. Comply with applicable provisions of AWS D1.2, "Structural Welding Code – Aluminum."
 - 2. Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.
- G. **Mockups:**
 - 1. Prior to installing glazed aluminum storefront system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.
 - 2. Build mockups using materials indicated for Work.
 - 3. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Engineer. Notify Construction Manager 7 days in advance of the dates and times when mockups will be constructed.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Engineer's approval of mockups before start of Work.
 - 6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

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7. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

H. Pre-installation Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements.
 2. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.07 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of a glazed aluminum storefront system that fail in materials or workmanship within the specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Failure of system to meet performance requirements.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - e. Failure of operating components to function normally.
 - f. Water leakage.
 - g. Glazing breakage.
 2. Aluminum Framing Warranty Period: 5 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.

- B. Basis of Design Manufacturer: Kawneer:
 - 1. Or approved equal.

- C. Aluminum-Framed Storefront:
 - 1. Exterior and Interior: Trifab® 451UT.
 - 2. Glass: Exterior Plane.
 - 3. Outside glazed pressure plate system with 2-1/2-inch x 4-1/2-inch framing members as manufactured by the Kawneer:
 - a. Glazing for Exterior 1-inch-thick, insulating units as specified in Section 088000, GLASS AND GLAZING.
 - 4. Finish: #40 DARK BRONZE, typical all units.

- D. Aluminum-Framed Entrances:
 - 1. 500 Swing Door; Medium stile, 5-inch vertical face dimension, 1-3/4-inch depth, high traffic applications as manufactured by Kawneer, or approved equal as follows:
 - a. Vertical Stile: 5 inches.
 - b. Top Rail: 5 inches.
 - c. Bottom Rail: 10 inches.
 - d. Glazing for Exterior Aluminum Entrances: 1-inch-thick insulating units as specified in Section 088000, GLASS AND GLAZING.
 - e. Glazing for Interior Aluminum Entrances: 1/4-inch Tempered units as specified in Section 088000, GLASS AND GLAZING.
 - 2. Finish: #40 DARK BRONZE AA-M10C21A44, Architectural Class I, (0.7 mils minimum).

- E. Exterior Aluminum Windows:
 - 1. GLASSvent UT™ Windows (Outswing Casement, Per Plan).
 - a. 2-13/16-inh (71.4 mm) system depth (1-inch Infill).

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- b. (P-HC40 – P-HC70) Project-Out Window.
- c. (C-HC40 – C-HC70) Outswing Casement Window (Emergency Egress Window).
- 2. Hardware.
 - a. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
 - b. Project-Out/Outswing Casement Windows: Provide the following operating hardware:
 - 1) Stainless Steel 4-Bar Hinges.
 - 2) Cast White Bronze Cam Locking Handles.
 - 3) Pivot-shoe Roto Operator.
- 3. Accessories.
 - a. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
 - b. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
 - c. Sealants and joint fillers for joints at perimeter of window system as specified in Section 079200, JOINT SEALANTS.
 - d. Insect Screens: Extruded aluminum frames, 6063-T6 alloy and temper, joined at corners: 18 x 16 mesh fiberglass screen cloth; frames finished to match aluminum windows; splines shall be extruded vinyl, removable to permit rescreening.
- 4. Finish: #40 DARK BRONZE, typical all units.

2.02 MATERIALS

- A. Aluminum:
 - 1. Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 2. Sheet and Plate: ASTM B209.
 - 3. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
 - 4. Extruded Structural Pipe and Tubes: ASTM B429.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: ASTM A36 for structural shapes, plates, and bars; ASTM A611 for cold-rolled sheet and strip; or ASTM A570 for hot-rolled sheet and strip.
- C. Framing System Gaskets and Joint Fillers: As recommended by manufacturer for joint type.

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- D. Glazing: Glass, glazing sealants and fillers as specified in Section 088000, GLASS AND GLAZING.
 - 1. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; in hardness recommended by manufacturer.
- E. Joint Sealants and Fillers: As specified in Section 079200, JOINT SEALANTS.
- F. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.03 COMPONENTS

- A. Brackets and Reinforcements:
 - 1. Provide manufacturer's standard high-strength aluminum brackets and reinforcements.
 - 2. Provide nonstaining, nonferrous shims for aligning system components.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
 - 1. Finish exposed portions to match glazed aluminum storefront.
 - 2. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
 - 3. Where fasteners anchor into aluminum less than 0.125-inch-thick, provide reinforcement to receive fastener threads.
 - 4. Use concealed fasteners unless otherwise approved by Engineer.
 - 5. Where exposed fasteners are approved, use countersunk Phillips screw heads finished to match framing members, unless otherwise indicated.
- C. Doors: Provide stiles and rails of type 6063-T5 aluminum alloy 2-inch minimum thickness tubular extrusions with a minimum 0.188-inch wall thickness.
 - 1. Construction: Pre-machine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory install hardware, except surface closers.
 - 2. Glazing Stops and Gaskets:
 - a. Exterior glazing stops: Permanent and integral to stile and rail extrusions.
 - b. Interior glazing stops: Provide with counter-punched holes and flat head screws.
 - c. No applied snap-on stops are permitted.
 - 3. Stile Design: Medium with 10-inch bottom rail, ADA compliant.
 - 4. Weather Stripping: Manufacturer's standard replaceable weather stripping.

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- a. Compression Weather Stripping: Molded neoprene complying with ASTM D2000 requirements or molded PVC complying with ASTM D2287 requirements.
- D. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer. Concrete Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

2.04 FABRICATION

- A. General: Fabricate glazed aluminum storefront system according to Shop Drawings.
 - 1. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
 - 2. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 3. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
 - 4. Prepare components to receive concealed fasteners and anchor and connection devices.
 - 5. Fabricate components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- B. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld before finishing components.
 - 1. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish.
 - 2. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- D. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible.
 - 1. Reinforce door and frame units as required for installing hardware indicated.
 - 2. Cut, drill, and tap for factory-installed hardware before finishing components.

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3. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
- E. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

2.05 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
1. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
 2. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

2.06 ALUMINUM FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Bronzed Anodized Finish:
1. AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.
 2. Provide Dark Bronze Anodized #40 finish.

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PART 3 - EXECUTION

3.01 EXAMINATION

- A. General: Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of glazed aluminum storefront system. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to Engineer have been made.

3.02 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum storefront system.
 - 1. Do not install damaged components.
 - 2. Fit joints to produce hairline joints free of burrs and distortion.
 - 3. Rigidly secure non-movement joints.
 - 4. Seal joints watertight, unless otherwise indicated.
 - 5. Provide means to drain water to the exterior to produce a permanently weatherproof system.
 - 6. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 7. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
 - 8. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
 - 9. Install framing members plumb and true in alignment with established lines and grades.
- B. Entrances: Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- C. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- D. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated.
 - 1. Weld in concealed locations to minimize distortion or discoloration of finish.
 - 2. Protect glazing surfaces from welding.

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- E. Field Glazing:
 - 1. Install glazing and sealant according to reviewed and approved Shop Drawings.
 - 2. Comply with requirements included in Section 088000, GLASS AND GLAZING, and in Section 079200, JOINT SEALANTS.

- F. Erection Tolerances: Install glazed aluminum storefront system to comply with the following maximum tolerances:
 - 1. Plumb: 1/8-inch in 10 feet; 1/4-inch in 40 feet.
 - 2. Level: 1/8-inch in 20 feet; 1/4-inch in 40 feet.
 - 3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16-inch; where a reveal or protruding element separates aligned surfaces by less than 2 inches, limit offset to 1/2-inch.
 - 4. Location: Limit variation from plane or location shown on Shop Drawings to 1/8-inch in 12 feet; 1/2-inch over total length.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing agency to perform testing indicated.

- B. Water Spray Test: After completing the installation of 500 sq. ft. minimum area of glazed aluminum storefront system, test system for water penetration according to AAMA 501.2 in a two-bay area directed by Engineer.

- C. Non-Compliant Work: Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.04 PROTECTION

- A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that will ensure glazed aluminum entrances and storefront system are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 085113

ALUMINUM CLAD WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this section.
- B. Section Includes:
 - 1. Aluminum Clad Wood Casement Crank Out Window: Stationary and operable units complete with hardware, glazing, weatherstripping, insect screens, jamb extensions, and standard or specified anchors, trim and attachments. Emergency egress required as noted.

1.02 RELATED SECTIONS

- A. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for interior trim and wood sills at window locations.
- B. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING, for window waterproofing.
- C. Section 076200, SHEET METAL AND FLASHING AND TRIM, for flashings at openings and decorative aluminum head and jamb at windows.
- D. Section 072726, FLUID-APPLIED WATERPROOF MEMBRANE AND AIR BARRIER.
- E. Section 074243, VENTILATED COMPOSITE WALL PANELS AND SOFFITS, for adjacent finished materials.
- F. Section 079200, JOINT SEALANTS, for sill sealant and perimeter caulking.
- G. Section 099123, INTERIOR PAINTING, for the finishing of the adjacent trim.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C1036: Standard Specification for Flat Glass.

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2. ASTM E283: Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.
 3. ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 4. ASTM E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic.
 5. ASTM E2190: Specification for Sealed Insulated Glass Units.
 6. ASTM E2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights
- B. American Architectural Manufacturers Association/Window and Door Manufacturers Association (AAMA / WDMA/CSA):
1. AAMA/WDMA/CSA 101/I.S.2/A440-05: Standard/Specification for windows, doors, and unit skylights
 2. AAMA/WDMA/CSA 101/I.S.2/A440-08: North American Fenestration, Standard/Specification for windows, doors, and skylights
 3. AAMA/WDMA/CSA 101/I.S.2/A440-11: NAFS – North American Fenestration, Standard/Specification for windows, doors, and skylights
 4. WDMA I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork
 5. Window and Door Manufacturers Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program
- C. Sealed Insulating Glass Manufacturers Association / Insulating Glass Certification Council (SIGMA/IGCC).
- D. American Architectural Manufacturers Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
- E. National Fenestration Rating Council (NFRC):
1. NFRC 101: Procedure for Determining Fenestration Product Thermal Properties.
 2. NFRC 200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 0133000, SUBMITTAL PROCEDURES.
- B. Product Data:
1. Construction details and fabrication methods.
 2. Profiles and dimensions of individual components.
 3. Data on hardware, accessories, and finishes.
 4. Recommendations for maintaining and cleaning exterior surfaces.

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5. For adhesives and sealants used inside of the weatherproofing system, including printed statement of VOC content.
- C. Shop Drawings:
1. Showing fabrication and installation of each type of window required including information not fully detailed in manufacturer's standard Product Data and the following:
 2. Layout and installation details, including anchors.
 3. Elevations at 1/4-inch = 1-foot scale and typical window unit elevations at 3/4-inch = 1-foot scale.
 4. Full-size section details of typical composite members, including reinforcement and stiffeners.
 5. Location of weep holes.
 6. Panning details.
 7. Hardware.
 8. Glazing and screen details.
 9. Accessories.
 10. Samples for Initial Selection: For units with factory-applied color finishes. Include similar Samples of hardware, screens, and accessories involving color selection.
 11. Samples for Color Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 12. Samples for Verification: The Engineer reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.
- D. Test Reports: Provide from a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated based on comprehensive testing of current window units within the last 5 years. Test results based on use of down-sized test units will not be accepted.
1. Quality Control Submittals, Certificates: submit manufacture's certification indicating compliance with specified performance and design requirement under provision of Section 013300, SUBMITTAL PROCEDURES.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum clad windows and doors similar in material, design, and extent to those required for this Project and with a record of successful in-service performance.
- B. Single-Source Responsibility: Obtain aluminum clad windows and doors from one source and by a single manufacturer.

SECTION 085113 – ALUMINUM CLAD WINDOWS

1.06 DELIVERY

- A. Comply with provisions of Section 016500, DELIVERY AND STORAGE.
- B. Deliver in original packaging and protect from weather.

1.07 STORAGE AND HANDLING

- A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than 30 days will expire between delivery and installation. Seal unfinished top and bottom edges of door and window panels if the panels are stored at the job site more than 1 week.
- B. Store door and window panels flat on a level surface in a clean and dry storage area above ground to protect from weather under provision of Section 016500, DELIVERY AND STORAGE.
- C. Condition doors and windows to local average humidity before installing.

1.08 WARRANTY

- A. Refer to Section 08 Glass and Glazing for glazing warranties.
- B. Provide a 20-year warranty for the aluminum finish against manufacturing defects resulting in chalk, fade and loss of adhesion (peel) per AAMA Specification 2605-11 Section 8.4 and 8.9 for 20 years from the original date of purchase.
- C. Provide a 10-year warrantee for Hardware and other non-glass components.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
- B. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
- C. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.

SECTION 085113 – ALUMINUM CLAD WINDOWS

- D. The burden of proof of equality of proposed products is on the Contractor.

2.02 ALUMINUM CLAD CASEMENT WINDOWS WITH FIXED SIDELIGHT

- A. Description: Factory assembled Clad Ultimate Casement/Awning, operating exterior swing window on Casement as manufactured by Marvin Windows and Doors, Warroad, Minnesota.
- B. Frame Description:
1. Interior: Douglas fir finger jointed core with cherry veneer. Kiln dried to moisture content no greater than 12 percent at the time of fabrication.
 2. Water repellent preservative treated in accordance with WDMA I.S.4.
 3. Frame exterior clad with 0.050-inch (1.3 mm) thick extruded aluminum.
 4. Frame thickness: 1-3/16-inch (30 mm).
 5. Frame depths for full-frame units have an overall 5-21/32-inch jamb (144 mm). 4-9/16-inch (116 mm) jamb depth from the nailing fin plane to the interior face of the frame for new construction.
 6. Frame bevel: 14-degree bevel.
- C. Sash Description:
1. Interior: Clear Douglas fir core with cherry veneer.
 2. Kiln dried to moisture content no greater than 12 percent at the time of fabrication.
 3. Water repellent preservative treated with accordance with WDMA I.S.4.
 4. Sash exterior clad with 0.050-inch (1.3 mm) thick extruded aluminum.
 5. Sash thickness: 1-7/8-inch (48 mm) for full-frame units.
 6. Stiles and Rails: 2-1/16-inch (52 mm).
 7. Sash: Tall bottom rail: 3-9/16-inch (90 mm).
 8. Interior Sash Sticking: Square sticking.
- D. Weather Strip:
1. Weather strip at the frame is a hollow foamed material bent around 90-degree corner to allow for seamless corner joints. Color: beige.
 2. Sash weather strip bulb shaped glass filled material. Color: beige.
- E. Jamb Extension:
1. Provide Jamb extension per details.
 2. Finish: Match interior frame finish.
- F. Insect Screen:
1. Wood Screen Surround with Hi Tran Fiberglass Screen. Species will match unit species.
- G. Finish:
1. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2605 requirements.
 - a. Clad color: Liberty Bronze Pearlescent.

SECTION 085113 – ALUMINUM CLAD WINDOWS

2. Interior Finish:
 - a. Factory Finish – Wheat.

2.03 HARDWARE

- A. Casement Operating Hardware:
 1. Locks: Multi-point sequential concealed locking system in the jamb opposite the hinge side for casement units. Lock handles are removable, non-handed and are available in the same finishes as the handles. Standard tie bars, cams and keepers – steel-coated with E-Gard™. Keeper features a roller for reduce average lock force and does not easily disengage with the cam even under severe loading.
 2. Handles: Satin chrome.
 3. Hinges: One at the sill to bottom rail, one at the head jamb to top rail. Hinges are steel coated with E-Gard™. Hinge track is stainless steel. Unit with a frame OM of 20 inches (508 mm) and greater use an 18-inch (457 mm) wash/egress hinge.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in Section 017300, EXECUTION. Report frame defects or unsuitable conditions to the General contractor before proceeding.
- B. Acceptance of Condition: Beginning on installation confirms acceptance of existing conditions.

3.02 INSTALLATION

- A. Assemble and install window/door unit(s) according to manufacturer's instruction and reviewed shop drawing.
- B. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 079200, JOINT SEALANTS. Do not use expansive foam sealant.
- C. Install accessory items as required.
- D. Use finish nails to apply wood trim and moldings.

SECTION 085113 – ALUMINUM CLAD WINDOWS

3.03 CLEANING

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.
- B. Leave windows, doors, and glass in a clean condition.

3.04 PROTECTING INSTALLED CONSTRUCTION

- A. Protecting door and windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

END OF SECTION

SECTION 086200

UNIT SKYLIGHTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Tubular day lighting system (self-flashing unit skylights with integral curb) in configurations as indicated on the Drawings.
- C. Related Sections:
 - 1. Section 054000, COLD-FORMED METAL FRAMING, for framing, curbs, and blocking.
 - 2. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING, for roofing and for flashing at unit skylights.
 - 3. Section 077200, ROOF ACCESSORIES, for roof hatches and other roof specialties.
 - 4. Section 079200, JOINT SEALANTS, for field-applied sealants not specified in this Section.

1.02 PERFORMANCE REQUIREMENTS

- A. Completed tubular day lighting system assemblies shall be capable of meeting the following performance requirements:
 - 1. Air Infiltration Test: Air infiltration will not exceed 0.30 cubic foot per minute per square foot (cfm/sf) aperture with a pressure delta of 1.57 pounds per square foot (psf) across the tube when tested in accordance with American Society for Testing and Materials (ASTM) E283.
 - 2. Water Resistance Test: No uncontrolled water leakage at 16.5-psf pressure differential with water rate of 5-gallons/hours/square feet when tested in accordance with ASTM E331.
 - 3. Uniform Load Test:
 - a. No breakage, permanent damage to fasteners, hardware parts, or damage to make tubular skylight inoperable or cause permanent deflection of any section in excess of 1 percent of its span at a Positive or Negative Load of 35-psf.

SECTION 086200 – UNIT SKYLIGHTS

- b. All units shall be tested with a safety factor of three for positive pressure and two for negative pressure, acting normal to plane of roof in accordance with ASTM E330.
- 4. Fire Testing:
 - a. Class B Burning Brand: The burning brand shall self-extinguish without transferring the fire to the dome per International Building Code (IBC) Standard 15-2 Class B Burning Brand Test (see ASTM E108 and UL 790).
 - b. Self-Ignition Temperature: Greater than 650 deg F per UBC Standard 26-6 (see ASTM D-1929-68).
 - c. Smoke Density: Rating no greater than 75 per UBC Standard 26-5 (See ASTM D2843) or no greater than 450 per UBC 8-1 (see ASTM Standard E84) in way intended for use).
 - d. Rate of Burn: Minimum Burning Rate: 2.5 inches/min, Classification CC-2: UBC Standard 26-7 (see ASTM D635).

1.03 REFERENCED STANDARDS

- A. ASTM (American Society for Testing and Materials):
 - 1. ASTM A463-01a, Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process; 2001a.
 - 2. ASTM A653-05, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM D635-03, Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 4. ASTM D1929-96, Test Method for Determining Ignition Temperature of Plastics (Reapproved 01).
 - 5. ASTM D4802-02, Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.
 - 6. ASTM E84-04, Test Method for Surface Burning Characteristics of Building Materials.
 - 7. ASTM E283-04, Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
 - 8. ASTM E308-06, Standard Practice for Computing the Colors of Objects by Using the CIE System.
 - 9. ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - 10. ASTM E331-00, Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- B. UL (Underwriters Laboratories) 181 – Factory Made Air Ducts and Air Connectors, Current Edition.

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- C. UL 790 – Standard for Tests for Fire Resistance of Roof Covering Materials; Current Edition.
- D. ICBO Evaluation Service, Inc. (ICBO)/International Code Council (ICC) AC-16 – Acceptance Criteria for Plastic Skylights; Current Edition.

1.04 SUBMITTALS

- A. General: Submit in conformance with General Requirements Section 013300 SUBMITTAL PROCEDURES.
- B. Product Data: For each type of unit skylight indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.
- C. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
- D. Samples for Verification: For each type of exposed finish required.
- E. Qualification Data: For qualified manufacturer and installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type and size of unit skylight.
- G. Maintenance Data: For unit skylights to include in maintenance manuals.
- H. Warranty: Sample of special warranty.
- I. Low Emitting Materials: For sealants used inside of the weatherproofing system, including printed statement of VOC content.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular skylights for minimum 10 years.
- B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.
- C. Source Limitations: Obtain unit skylights from single source from single manufacturer.
- D. Surface-Burning Characteristics of Plastic Glazing: Provide plastic glazing sheets identical to those tested for fire-exposure behavior per test method indicated below by a testing and inspecting agency acceptable to authorities

SECTION 086200 – UNIT SKYLIGHTS

having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested per ASTM D1929.
2. Smoke-Production Characteristics: Comply with either requirement below:
 - a. Smoke-Developed Index: 450 or less when tested per ASTM E84 on plastic sheets in manner indicated for use.
 - b. Smoke Density: 75 or less when tested per ASTM D2843 on plastic sheets in thickness indicated for use.
3. Burning Characteristics: Tested per ASTM D635.
 - a. Polycarbonate Glazing: Class CC1, burning extent of 1-inch or less for nominal thickness of 0.060-inch or thickness indicated for use.

1.06 COORDINATION

- A. Coordinate unit skylight flashing requirements with roofing system.
- B. Coordinate sizes and locations of prefabricated curbs with actual unit skylights provided.
- C. Provide anchors and inserts to be placed in adjacent construction in proper sequence so as not to delay the Work.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Uncontrolled water leakage.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Yellowing of acrylic glazing.
 - d. Breakage of polycarbonate glazing.
 - e. Deterioration of insulating-glass hermetic seal.
 2. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Products named or identified by make or model number, or other designation and described below are base products. Base products

SECTION 086200 – UNIT SKYLIGHTS

establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.

2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS. products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Tubular Day Lighting System (Self-Flashing Unit Skylights with Integral Curb):
1. Solatube International, Inc., 2210 Oak Ridge Way; Vista, CA; Phone: (888) 765-2882 or (760) 477-1120; Fax: (760) 597-4488; Email: commsales@solatube.com; Website: www.solatube.com.
 2. Or approved equal.

2.02 TUBULAR DAYLIGHTING DEVICES

- A. Tubular Daylighting Devices General: Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.
- B. Daylighting System
1. SolaMaster Series: Solatube Model 330 DS-C, 21-inch, C Closed (Penetrating) Ceiling. AAMA Type TDDCC.
- C. Capture Zone:
1. Roof Dome Assembly: Transparent, ultraviolet (UV) and impact resistant dome with flashing base supporting dome and top of tube.
 2. Dome Glazing: Type DA, 0.143-inch minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.
 3. Tube Ring: Attached to top of base section; 0.090-inch nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing. Attached to the base of the dome ring using butyl glazing rope 0.24-inch (6 mm) diameter; to minimize air infiltration.
 4. Dome Seal: Adhesive backed weatherstrip, 0.63-inch (16 mm) tall by 0.28-inch (7 mm) wide.
 5. LightTracker Reflector, made of aluminum sheet, thickness 0.015-inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.

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- D. Dome Accessories:
1. Security Bar: Type B Security Bar 0.375-inch (95 mm) stainless steel bar across flashing diameter opening.
 2. Dome Edge Protection Band: Type PB, for fire rated Class A, B, or C roof applications. Galvanized steel. Nominal thickness of 0.039-inch (1 mm).
 3. Secondary Diffuser: Type SS, Acrylic plastic classified as CC2 material. Thickness shall not be less than 0.100 inches.
- E. Flashings:
1. Roof Flashing Base:
 - a. One Piece: One-piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A653/A 653M or ASTM A463/A 463M or ASTM A792/A 792M, 0.028-inch (0.7 mm) plus or minus 0.006-inch (0.015 mm) thick.
 - b. Base Style: Type F11, Self-Mounted, 11 inches (279 mm) high.
 2. Flashing Accessories:
 - a. Flashing Insulator: Type FI, Thermal isolation material is for use under the following flashing types: Type F11.
 - b. Roof Flashing Turret Extensions: Provide extensions for applications as required. Refer to design documents.
 - c. Membrane Counter Flashing: Type MCF, one-piece, seamless, spun Aluminum Alloy 1100, functioning as a counter flashing for use with F11 Flashings, only, when applied to membrane roofs. Corrosion resistant conforming to ASTM B209, 0.059-inch (1.5 mm) thick.
- F. Transfer Zone:
1. Extension Tubes: Aluminum sheet, thickness 0.018-inch (0.5 mm).
 2. Reflective Tubes: Reflective extension tube, Type EXX and Type EL with total length of run as indicated on the Drawings.
 3. Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.
- G. Tubes
1. Provide Top Tube Angle Adapter, Bottom Tube and Extension Tube Angle Adapter as necessary to achieve placement of lenses per drawings.
 2. Thermal Insulation Panel: Type TIP, high-performance dual-glazed, thermally broken tube insulation system.
 3. Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.
 4. Spectralight Infinity SoftLight Extension Tube: Include one Type ES, 24-inch (610mm) Super-reflective extension tube in each assembly with structured surface providing precise light spread for enhanced visual comfort.

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H. Delivery Zone:

1. Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E283. Visible Light Transmission shall be greater than 90 percent at 0.022-inch (0.6 mm) thick. Classified as CC2.
2. Diffuser Seal: Open cell foam, acrylic adhesive backed, 0.75-inch (19 mm) wide by 0.125-inch (3.2 mm) thick to minimize condensation and bug, dirt and air infiltration per ASTM E283.
3. Diffuser Trim Ring: Injection molded acrylic. Nominal wall thickness 0.172 inches (4.4 mm).
4. Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.
5. Metal Transition Box: Type TM, Metal 2 Round to Square transition box comprised of Spectralight Infinity SoftLight material with structured finish on exposed reflective surface, 0.015-inch (0.4mm) thick. Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E308.
6. Secondary Diffuser: Type SS, Acrylic plastic classified as CC2 material. Thickness shall not be less than 0.100 inches.

I. Delivery Zone Controls

1. Provide a Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use.
2. Provide a Daylight Dimmer: Type D, Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable by skylight contractor. Cable circuited, 4 conductor, size 22 AWG when total aggregate circuit runs are under 200 feet (60.96 m) or size 18 AWG when total aggregate circuit runs are under 500 feet (152.4 m); providing daylight output between 2 and 100 percent. Connect to nearest lighting branch circuit with (2) #12 wires and (1) #12 cu ground in 1/2-inch conduit. (MC Cables allowed above accessible ceiling spaces). Place dimmer switch at entry to each space with skylight or at the center of each corridor. Provide box and ring for dimmer switch and 1/2-inch c. to accessible ceiling space for low voltage wiring.

J. Accessories

1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: only one switch is required per set of synchronously controlled dimmers. For use with Daylight Dimmer, Type D, only.

SECTION 086200 – UNIT SKYLIGHTS

2.03 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.
- B. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with unit skylight installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
- B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights. Install unit skylights level, plumb, and true to line, without distortion. Anchor unit skylights securely to supporting substrates.
- C. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.
- D. Set unit skylight flanges in thick bed of roofing cement to form a seal unless otherwise indicated.
- E. Where cap flashing is indicated, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

SECTION 086200 – UNIT SKYLIGHTS

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. After installation of first unit of each type, field test to determine adequacy of installation.
 - 1. After completion of installation and nominal curing of sealant and glazing compounds but before installation of interior finishes, test for water leaks according to AAMA 501.2.
 - 2. Perform test for total area of each type of unit skylight.
 - 3. Conduct water test in presence of City, Engineer, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.
 - 4. Work will be considered defective if it does not pass tests and inspections.
 - 5. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.04 CLEANING

- A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.
- B. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

PART 4 - MEASUREMENT AND PAYMENT

- A. Unit Skylights associated with the Fire Station No. 20 Building as specified herein shall be included in the measurement and payment for "Fire Station No. 20 Building; Including Trash Enclosure."
- B. P Unit Skylights associated with the Fireboat Bay No. 20 Enclosure as specified herein shall be included in the measurement and payment for "Fireboat Bay No. 20 Enclosure."

SECTION 086200 – UNIT SKYLIGHTS

- C. No separate measurement and payment will be made for any Work covered by this Section. The cost of this Work shall be considered incidental to and included in the Schedule of Bid Items.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Door hardware, including electric hardware.
 2. Storefront and entrance door hardware.
 3. Power supplies for electric hardware.
- B. Related Divisions:
1. Section 079200, JOINT SEALANTS, sealant at exterior thresholds.
 2. Section 081113, HOLLOW METAL DOORS AND FRAMES, hardware for metal doors and frames.
 3. Section 084413, ALUMINUM FRAMED ENTRANCES AND STOREFRONT, for electrical locks to be provided by this section for entrance doors.
 4. Section 211000, FIRE SUPPRESSION SYSTEM, fire and life safety systems.
 5. Section 323119, FENCES, GATES AND MORTORIZED OPERATORS, for hardware to be provided by this section for the pedestrian gates.
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
1. Windows.
 2. Cabinets, including open wall shelving and locks.
 3. Signs, except where scheduled.
 4. Toilet accessories, including grab bars.
 5. Installation.
 6. Rough hardware.
 7. Conduit, junction boxes, and wiring.
 8. Access doors and panels, except cylinders where detailed.
 9. Corner guards.

1.02 REFERENCES

- A. Use date of standard in effect as of Bid date.
1. American National Standards Institute (ANSI):
 - a. ANSI 156.18, Materials and Finishes.
 2. Builders Hardware Manufacturers Association (BHMA).
 3. 2019 California Building Code (CBC):

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- a. Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
4. National Fire Protection Association (NFPA):
 - a. NFPA 80 2019 Edition, Standard for Fire Doors and Other Opening Protectives.
 - b. NFPA 105, Smoke and Draft Control Door Assemblies.
 - c. NFPA 252, Fire Tests of Door Assemblies.
5. Underwriters Laboratories (UL):
 - a. UL10C, Positive Pressure Fire Tests of Door Assemblies.
 - b. UL 305, Panic Hardware.
6. Local applicable codes.
7. Steel Door Institute (SDI).

B. Abbreviations:

1. Manufacturers: See Table at 2.1.A of this Section.
2. Finishes: See paragraph 2.07, Finishes, of this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. Submittals:

1. Submit six copies of schedule per D. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information:
 - a. Type, style, function, size, quantity and finish of hardware items.
 - b. Use BHMA Finish codes per ANSI A156.18.
 - c. Name, part number and manufacturer of each item.
 - d. Fastenings and other pertinent information.
 - e. Location of hardware set coordinated with floor plans and door schedule.
 - f. Explanation of abbreviations, symbols, and codes contained in schedule.
 - g. Mounting locations for hardware.
 - h. Door and frame sizes, materials and degrees of swing.
 - i. List of manufacturers used and their nearest representative with address and phone number.
 - j. Catalog cuts.
 - k. Point-to-point wiring diagrams.
 - l. Manufacturer’s technical data and installation instructions for electronic hardware.
2. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.
3. Deviations: Highlight, encircle or otherwise identify deviations from “Schedule of Finish Hardware” on submittal with notations clearly designating those portions as deviating from this section.

SECTION 087100 – DOOR HARDWARE

4. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

B. Substitutions:

1. Include product data and indicate benefit to the Project, see Section 012500, SUBSTITUTIONS. Furnish operating samples on request.
2. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.
3. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect, and Contractor.
 - a. Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

- B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

- D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

- E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Coordinate delivery to appropriate locations (shop or field).

SECTION 087100 – DOOR HARDWARE

- B. Permanent Keys and Cores: Secured delivery direct to Owner's representative.
- C. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.
- D. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.06 PROJECT CONDITIONS AND COORDINATION:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
 - 1. Location of embedded and attached items to concrete.
 - 2. Location of wall-mounted hardware, including wall stops.
 - 3. Location of finish floor materials and floor-mounted hardware.
 - 4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
 - 5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
 - 6. Coordinate: Flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
 - 7. Manufacturers' templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.
- D. Environmental considerations: segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

SECTION 087100 – DOOR HARDWARE

1.07 WARRANTY

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.
- B. Include factory order numbers with close-out documents warranty information:
- C. Minimum warranties:
 - 1. Locksets: 3 years.
 - 2. Extra Heavy Duty Cylindrical Lock: 7 years.
 - 3. Exit Devices: 3 years mechanical, 1 year electrical.
 - 4. Closers: 30 years mechanical, 2 years electrical.
 - 5. Hinges: 1 year.
 - 6. Other Hardware: 2 years.

1.08 COMMISSIONING

- A. Conduct these tests prior to request for certificate of substantial completion:
 - 1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
 - 2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
 - 3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Listed acceptable alternate manufacturers: these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM	MANUFACTURER	ACCEPTABLE ALTERNATE
Hinges	(IVE) Ives	Bommer
Pivots	(IVE) Ives	Rixson
Key System	(MED) Medico	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Electronic Locks	(SCH) Schlage	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard

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Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Rockwood, Trimco
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops and Holders	(IVE) Ives	Rockwood, Trimco
Overhead Stops	(GLY) Glynn-Johnson	ABH
Thresholds	(ZER) Zero	NGP, Reese
Seals and Bottoms	(ZER) Zero	NGP, Reese

2.02 HINGING METHODS

- A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.
- B. Doors 3-1/2 feet or wider use 5-inch X 4-1/2-inch heavy weight hinges.
- C. Doors 8 feet use four hinges and add one hinge for every foot thereafter.
- D. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.
- E. Conventional Hinges: Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
 - 1. Outswinging exterior doors: stainless steel hinges with non-removable (NRP) pins and security studs.
 - 2. Stainless steel material exteriors and at doors subject to corrosive atmospheric conditions.
- F. Pivots: High-strength forged bronze or stainless steel, tilt-on precision bearing and bearing pin.
 - 1. Bottom and intermediate pivots: adjustability of minus 0.063-inch, plus 0.125-inch.

2.03 LOCKSETS, LATCHSETS, DEADBOLTS

- A. Mortise Locksets and Latchsets: As scheduled.
 - 1. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
 - 2. Universal lock case: Ten functions in one case.
 - 3. Floating mounting tabs automatically adjusts to fit a beveled door edge.

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4. Latchbolts: 0.75-inch throw stainless steel anti-friction type.
 5. Lever Trim: Through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
 - a. Spindles: Security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
 - b. Inside lever applied by screwless shank mounting – no exposed trim mount screws.
 - c. Levers rotate up or down for ease of use.
 6. Turnpieces: Accessible offset turn-lever design not requiring pinching or twisting motions to operate.
 7. Deadbolts: Stainless steel 1-inch throw.
 8. Electric operation: Manufacturer-installed continuous duty solenoid.
 9. Strikes: 16 gage curved steel, bronze or brass with 1-inch-deep box construction, lips of sufficient length to clear trim and protect clothing.
 10. Scheduled lock series and design: Schlage L series, design to be 06A.
 11. Certifications:
 - a. ANSI A156.13, 1994, Grade 1 Operational.
 - b. ANSI/ASTM F476-84 Grade 31 UL Listed.
 12. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2019 11B-404.2.7 and 11B-309.4.
- B. Product: Schlage AD-200-MSadaptable mortise-type electronic locksets.
1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is field reversible for handing without opening case.
 2. Backset: 2-3/4-inch (70 mm), nominal.
 3. Latchbolt: Three-piece, beveled, stainless steel with 3/4-inch (19 mm) throw and anti-friction latch.
 4. Deadbolt: Where deadbolt function is scheduled, provide stainless steel deadbolt interconnected with latch 1-5/8-inch (41 mm) high and 5/8-inch (16 mm) thick with 1-inch throw.
 5. Chassis: ANSI/BHMA standard mortise lock prep for 1-3/4-inch (44 mm) doors.
- C. Requirements:
1. Provide adaptable electronic access control products that comply with the following requirements:
 - a. Listed, UL 294. The Standard of Safety for Access Control System Units.
 - b. Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security.
 - c. Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
 - d. Compliant with ASTM E330 for door assemblies.

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- e. Compliant with ICC/ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
2. Functions: Provide functions as scheduled that are field configurable without taking the adaptable electronic product off the door.
3. Emergency Override: Provide mechanical key override; cylinders: Refer to “KEYING” article, herein.
4. Stand alone, non-networked using a keypad.

2.04 EXIT DEVICES/PANIC HARDWARE

A. General Features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. Deadlocking latchbolts, 0.75-inch projection.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-lb maximum operating force per UBC Standard 10-4, and with 32-lb maximum pressure under 250-lb load to the door.
8. Lever design to match locksets
9. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2019 11B-404.2.7 and 11B-309.4.
 - a. Mechanical method: where touchpad directly retracts the latchbolt with 5 lb or less of force.

B. Specific Features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130-inch thickness, compression spring drive, match lockset lever design.
3. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.

C. Product: Schlage AD-200-993 adaptable electronic exit device trim.

1. Provide exit device trim conforming to ANSI/BHMA A156.25, non-handed, field-reversible.
2. Exit Device Configurations: Stand alone, non-networked using a keypad. Exit device lever trim to retract latchbolt of the exit device

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2.05 CLOSERS

- A. Surface Closers: 4040-XP.
 - 1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast-iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
 - 2. ISO 2000 certified. Units stamped with date-of-manufacture code.
 - 3. Independent lab-tested 10,000,000 cycles.
 - 4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
 - 5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
 - 6. Adjust doors to open with not more than 5 lbs pressure to open at exterior doors and 5 lbs at interior doors. As allowed per 2019 CBC Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15 lbs.

- B. Exception: Exterior doors' pressure-to-open may be increased to 8-1/2 lbs if at a single location and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
 - 1. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
 - 2. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
 - 3. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
 - 4. Exterior doors: seasonal adjustments not required for temperatures from 120 deg F to -30 deg F, furnish checking fluid data on request.
 - 5. Non-flaming fluid will not fuel door or floor covering fires.
 - 6. Pressure Relief Valves (PRV) not permitted.

2.06 OTHER HARDWARE

- A. Automatic Flush Bolts: Low operating force design.

- B. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

- C. Kick Plates: Four beveled edges, 0.050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

- D. Door Stops: Provide stops to protect walls, casework or other hardware.
 - 1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.

SECTION 087100 – DOOR HARDWARE

2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90-degree stop/95-degree deadstop. Note degree of opening in submittal.
- E. Automatic Door Bottoms: Low operating force units.
 1. Include automatic type door bottoms, as opposed to fixed sweeps, at stairs and elevator lobbies to allow fine-tuning of pressurization systems.
- F. Thresholds: To be provided by this section, as scheduled and per details. Comply with CBC 2019 11B-404.2.5.
- G. Substitute Products: Certify that the products equal or exceed specified material's thickness.
- H. Proposed Substitutions: Submit for approval.
 1. Saddle thresholds: 0.125 inches minimum thickness.
 2. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 07, Thermal and Moisture Protection. Minimum 0.25-inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) flat head sleeve anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
 3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
 4. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.
- I. Through-bolts: Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
 1. Exception: Surface-mounted overhead stops, holders, and friction stays.
- J. Silencers: Interior hollow metal frames, three for single doors, four for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes.
- K. Intent: Door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal. Provide where seals are not used.

2.07 FINISHES

- A. Generally: BHMA 626 Satin Chromium Areas using BHMA 626. Furnish push-plates, pulls, and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

SECTION 087100 – DOOR HARDWARE

- B. Door Closers: Factory powder coated to match other hardware, unless otherwise noted.

2.08 KEYING REQUIREMENTS

- A. Key System: Schlage keyway, interchangeable core. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and Supplier representatives to determine system requirements and keybow styles. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Owner will receive and sign for permanent cores. Owner will install permanent cores.
- B. Keys:
 1. Existing factory registered master key system.
 2. Construction keying: Furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cores in Owner's presence. Demonstrate that construction key no longer operates.
 3. Furnish 10 construction keys.
 4. Furnish two construction control keys.
 5. Key cylinders: Furnish 6-pin solid brass construction.
 6. Cylinder cores: Furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.
 7. Permanent keys: Unsecured shipment direct from point of origination to Owner.
 8. For estimate: Three keys per change combination, five master keys per group, five grand-master keys, three control keys.
 9. For estimate: VKC stamping plus "DO NOT DUPLICATE".
 10. Bitting list: Use secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

- A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

SECTION 087100 – DOOR HARDWARE

3.02 PREPARATION

- A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.
- B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 1. Notify Architect of code conflicts before ordering material.
 - 2. Locate latching hardware between 34 inches to 44 inches above the finished floor, per CBC Section 1010.1.9.2 and 11B-404.2.7.
 - 3. Locate panic hardware between 36 inches to 44 inches above the finished floor.
 - 4. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.
- C. Overhead Stops: Before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.03 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
 - 1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc.; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 - 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
 - 3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
 - 4. Replace fasteners damaged by power-driven tools.
- B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See 2.02, Hinging Methods, regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
- C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

SECTION 087100 – DOOR HARDWARE

- D. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.
- E. Drill pilot holes for fasteners in wood doors and/or frames.
- F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.04 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
 - 1. Hardware damaged by improper installation or adjustment methods: Repair or replace to Owner's satisfaction.
 - 2. Adjust doors to fully latch with no more than 1 lb of pressure.
 - a. Door closer valves: Turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.
 - 3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
 - 4. Adjust door closers per paragraph 2.05, Closers, of this Section.
- B. Fire-rated Doors:
 - 1. Wood doors: Adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
 - 2. Steel doors: Adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
 - 3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.
- C. Final Inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:
 - 1. Has re-adjusted hardware.
 - 2. Has evaluated maintenance procedures and recommends changes or additions and instructed Owner's personnel.
 - 3. Has identified items that have deteriorated or failed.
 - 4. Has submitted written report identifying problems.

3.05 DEMONSTRATION

- A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

SECTION 087100 – DOOR HARDWARE

3.06 PROTECTION/CLEANING

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame, and door surfaces soiled from installation/reinstallation process.

3.07 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.

HW SET: 010.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE	L9010 06L	626	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 012

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE	L9010 06L	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 012.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE	L9010 06L	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 020.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06L	626	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 022.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06L	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW	630	IVE

SECTION 087100 – DOOR HARDWARE

1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 030

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T L583-363 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 030.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T L583-363 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 031

3	EA	HINGE	3CB1HW 5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T L583-363 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	OVERHEAD HOLDER	90H	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 032

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T L583-363 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 032.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	L9050T L583-363 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 052.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

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HW SET: 072.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ELECTRONIC LOCK	AD-200-MS-50-KP-RHO-TD	626	SCE
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 082

3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	EXIT DEVICE	AX-98-L-996L-06	626	VON
1	EA	IC RIM CYLINDER	20-057	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 082.2

3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	EXIT DEVICE	AX-98-L-996L-06	626	VON
1	EA	IC RIM CYLINDER	20-057	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

HW SET: 122.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06L	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	364AA	CL	ZER

HW SET: 123.2

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06L	626	SCH
1	EA	CLOSER	4040XP S-CUSH	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	SET	PERIMETER SEALS	270A HEAD AND JAMBS	AL	ZER

SECTION 087100 – DOOR HARDWARE

HW SET: 152

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER

HW SET: 486

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	EXIT DEVICE	AX-98-L-NL-996L-06-LD	626	VON
1	EA	IC RIM CYLINDER	20-057	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 492

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	EXIT DEVICE	AX-98-EO	626	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-50-KP-RHO-TD	626	SCE
1	EA	IC CYLINDER	AS REQUIRED	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 493

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	EXIT DEVICE	AX-98-EO	626	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-50-KP-RHO-TD	626	SCE
1	EA	IC CYLINDER	AS REQUIRED	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP S-CUSH	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW	630	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

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HW SET: 554

6	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	SET	AUTO FLUSH BOLT	FB31/41 AS REQ'D	626	IVE
1	EA	DUST PROOF STRIKE	DP1/2 AS REQ'D	626	IVE
1	EA	STOREROOM LOCK	L9080T 06L	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	COORDINATOR	COR2-COMPLETE	628	IVE
2	EA	CLOSER	4040XP H-EDA	689	LCN
2	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
2	EA	DOOR SWEEP	339AA	AL	ZER
1	EA	ASTRAGAL	44STST X 188	600	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 960

ALL HARDWARE BY ROLL UP
DOOR MANUFACTURER B/O

HW SET: 970

ALL HARDWARE BY GATE
MANUFACTURER B/O

HW SET: A492

1	EA	PIVOT SET	7215	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	EXIT DEVICE	AX-98-EO	626	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-50-KP-RHO-TD	626	SCE
1	EA	IC RIM CYLINDER	20-057	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	MOUNTING PLATE	4040-18	689	LCN
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	EA	THRESHOLD	AS DETAILED	AL	ZER

SEALS AND SWEEPS BY DOOR MANUFACTURER
DOOR MUST HAVE WIDE STILES TO MOUNT EXIT DEVICE

END OF SECTION

SECTION 088000
GLASS AND GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Interior and exterior glass and glazing for the following applications, including those specified in other Sections where glazing requirements are specified by reference to this Section; monolithic and insulated units as scheduled at the end of PART 3:
 - a. Hollow metal doors and frames.
 - b. Wood doors.
 - c. Aluminum windows.
 - d. Aluminum Clad windows.
 - e. Aluminum storefront framing
 - f. Aluminum entrances.
 - g. Aluminum Curtainwall Systems
 - h. Spandrel Glazing.
- B. Related Sections:
1. Section 079200, JOINT SEALANTS, for perimeter joint sealants.
 2. Section 081113, HOLLOW METAL DOORS AND FRAMES, for steel doors and frames to receive glazing.
 3. Section 081416, FLUSH WOOD DOORS, for interior wood doors to receive glazing.
 4. Section 083513, AUTOMATIC FOLDING DOORS, for motor-operated four-fold steel doors with insulated laminated safety glazing.
 5. Section 084400, GLAZED ALUMINUM CURTAINWALL SYSTEM, for curtain wall systems to received insulated glazing.
 6. Section 084413, ALUMINUM FRAMED ENTRANCES AND STOREFRONT SYSTEMS, for aluminum entrance doors and storefront systems.
 7. Section 085113, ALUMINUM CLAD WINDOWS, for insulated glazing requirements.
 8. Section 088300, MIRRORS, for frameless mirrors.

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9. Section 102820, GLASS SHOWER DOORS AND PANELS, for shower door systems.

1.03 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design:
 1. Glass thickness indicated is a minimum and is indicated for detailing only.
 2. Confirm glass thickness by analyzing Project loads and in-service conditions.
 3. Provide glass lites for various size openings in nominal thickness indicated, but not less than thickness and in strengths (annealed or heat treated) required to meet or exceed the specified criteria.
- C. Glass Thickness for Exterior Applications:
 1. Select minimum glass thickness to comply with ASTM E1300, according to the following requirements:
 2. Specified Design Wind Loads: As required by applicable codes for Project location.
 3. Probability of Breakage for Vertical Glazing: 8 lites per 1,000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 4. Maximum Lateral Deflection: For insulating glass units supported on all four edges, provide glass thicknesses required that limits center deflection at design wind pressure to 1/50 times the short side length or 1-inch, whichever is less.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

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1.05 REFERENCED STANDARDS

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 800-05 Voluntary Specifications and Test Methods for Sealants.
- B. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1-2004 Glazing Materials Used in Buildings-Safety Performance Specifications and Method of Test.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM C509-00 Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
 - 2. ASTM C864-05 Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 3. ASTM C920-05 Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1021-01 Practice for Laboratories Engaged in Testing of Building Sealants.
 - 5. ASTM C1036-01 Specification for Flat Glass.
 - 6. ASTM C1048-04 Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 - 7. ASTM C1115-00 Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
 - 8. ASTM C1281-03 Specification for Preformed Tape Sealants for Glazing Applications.
 - 9. ASTM C1330-02 Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 - 10. ASTM C1376-03 Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
 - 11. ASTM E1300-04 Practice for Determining Load Resistance of Glass in Buildings.
 - 12. ASTM E2074-00 Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.
 - 13. ASTM E2190-02 Specification for Insulating Glass Unit Performance and Evaluation.
- D. California Building Code (CBC) – 2019.
- E. Code of Federal Regulations (CFR):
 - 1. 16 CFR 1201-16 Safety Standard for Architectural Glazing Materials.
- F. Glass Association of North America (GANA):
 - 1. Glazing Manual. Current Edition.
 - 2. Laminated Glass Design Guide, Current Edition.
 - 3. Engineering Standards Manual, Current Edition.
 - 4. Insulating Glass Manufacturers Alliance.

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5. SIGMA TM-3000-90: North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use (Current Edition).

1.06 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each glass product and glazing material indicated.
- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
 1. Fire-rated glass, clear.
 2. Spandrel glass.
 3. Insulating glass unit.
- D. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch lengths.
- E. Qualification Data: For installers and for manufacturers of insulating-glass units with low-e coatings.
- F. Product Certificates: For glass and glazing products, from manufacturer.
- G. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Source Limitations for Glass: Obtain coated float glass and insulating glass from single source from single manufacturer for each glass type.
- D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

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1. IGMA Publication for Insulating Glass: SIGMA TM-3000, “North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.”
- F. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- H. Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire protective assemblies.
- I. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per ASTM E2074-00 and UL 10B, labeled and listed by UL.
- J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Install glazing in mockups specified in Section 084413, ALUMINUM-FRAMED ENTRANCES AND STOREFRONT SYSTEMS, to match glazing systems required for Project, including glazing methods.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- K. Preinstallation Conference: Conduct conference at Project site.
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review temporary protection requirements for glazing during and after installation.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

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1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive City of other rights City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty for Coated-Glass Products:
 - 1. Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period.
 - 2. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions.
 - 3. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 4. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass:
 - 1. Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period.
 - 2. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions.
 - 3. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 4. Warranty Period: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
1. Products specified by product name, or other designation and described elsewhere in this specification section are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
 5. Provide glazing types as indicated in GLASS SCHEDULES at the end of PART 3.
- B. Primary and Heat-Treated Float Glass:
1. AGC Flat Glass North America.
 2. Guardian Industries.
 3. Pilkington.
 4. PPG Industries, Inc.
 5. Or approved equal.

2.02 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on the following procedures:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

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2.03 GLASS PRODUCTS

- A. Primary Float Glass: ASTM C1036, Type I (transparent glass, flat), Quality q3 (glazing select); Class 1 (clear), or Class 2 (tinted), as indicated in Glass Schedule at the end of PART 3.
- B. Heat-Treated Float Glass: ASTM C1048; Type I (transparent glass, flat); Quality q3 (glazing select); fully tempered where required by code or, heat-strengthened where required for compliance with structural performance requirements.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, tongless, or free of tong marks, unless otherwise indicated.
- C. Coated Vision Glass: ASTM C1376, coated by vacuum deposition (sputter-coating) process, and complying with other requirements specified.
 - 1. Kind: Kind CV (coated vision glass).
 - 2. Coating Color: As scheduled in PART 3.
 - 3. Visible Light Transmittance: As scheduled in PART 3.
 - 4. Outdoor Visible Reflectance: As scheduled in PART 3.
- D. Spandrel Glass:
 - 1. Monolithic OPACI-COAT-300® Spandrel Glass by ICD High performance Coatings. www.icdcoatings.com.
 - 2. The OPACI-COAT-300® opacifying coating shall have a minimum thickness of 4 to 5 mils dry (0.004-inch/0.10mm to 0.005-inch/0.127mm). For fallout protection a minimum thickness of 6.50 mils dry (0.0065-inch/0.17mm) is required.
 - 3. Only approved Factory Fabricators (AFF) are allowed to produce the OPACICOAT-300® silicone spandrel.
 - 4. Color Match. Contractor to provide color match samples for selection by the architect.

2.04 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 - 2. Spacer: Aluminum with powdered metal paint finish in color to match exterior frame finish of windows and storefront.
 - 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- B. Indoor and Outdoor Lites: Laminated glass as specified in Article 2.3-Glass Products, and as scheduled in Articles 3.8 and 3.9.

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2.05 GLAZING GASKETS FOR NON-FIRE-RATED GLASS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.06 GLAZING SEALANTS FOR NON-FIRE-RATED GLASS

- A. General: Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 1. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 2. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
 - 3. Colors of Exposed Glazing Sealants: As selected by Engineer from manufacturer's full range of colors.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials – Silicones; SilPruf LM SCS2700.
 - c. Pecora Corporation; 890.
 - d. Tremco Incorporated; Spectrem 1.

2.07 GLAZING TAPES FOR NON-FIRE-RATED GLASS

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

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3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.08 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.09 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

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1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face

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clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
 - I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
 - J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
 - K. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
 1. Place glazing tape on free perimeter of glazing in same manner described above.
 2. Install removable stop and secure without displacement of tape.
 3. Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.
 4. Install in vision panels in fire-rated doors to requirements of NFPA 80.
 5. Install so that appropriate UL and FireLite Plus® markings remain permanently visible.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

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- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.05 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure.
 - 1. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

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- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.08 INTERIOR GLASS SCHEDULE

- A. Typical glass, unless otherwise noted:
 - 1. 7/32-inch-thick, safety-rated clear glazing with clear interlayer.

3.09 EXTERIOR GLASS SCHEDULE

- A. Typical Clear Glazing:
 - 1. Solar Control Low-E Ultra-Clear Insulating-Glass Units as follows:
 - a. Unit Overall Thickness: 1-inch.
 - b. Interspace Content: Air or Argon gas as required.
 - c. Outdoor Lite: 1/4-inch-thick clear float glass (safety rated where required); SunGuard SuperNeutral 54 coating on second surface, by Guardian or approved equal.
 - d. Indoor Lite: 1/4-inch-thick clear float glass. Safety rated where required.
 - e. Visible Light Transmittance (VLT): 54 percent minimum.
 - f. Winter Nighttime U-Factor: 0.29 maximum.
 - g. Summer Daytime U-Factor: 0.27 maximum.

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- h. Solar Heat Gain Coefficient (SHGC): 0.28 maximum.
 - i. Outdoor Visible Light Reflectance: 11 percent maximum.
 - j. Light to Solar Gain (LSG): 1.91 minimum.
- B. Spandrel Glazing, where indicated:
- 1. Solar Control Low-E Ultra-Clear Insulating-Glass Units as follows:
 - a. Unit Overall Thickness: 1-inch.
 - b. Interspace Content: Air or Argon gas as required.
 - c. Outdoor Lite: 1/4-inch-thick clear float glass (safety rated where required); Monolithic OPACI-COAT-300® Spandrel Glass by ICD High performance Coatings. www.icdcoatings.com
 - d. Indoor Lite: 1/4-inch-thick clear float glass. Safety rated where required.
 - e. Winter Nighttime U-Factor: 0.29 maximum.
 - f. Summer Daytime U-Factor: 0.27 maximum.
 - g. Solar Heat Gain Coefficient (SHGC): 0.28 maximum.
 - h. Outdoor Visible Light Reflectance: 11 percent maximum.

END OF SECTION

SECTION 088300

MIRRORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Film-backed, silvered flat glass mirrors qualifying as safety glazing for fitness room.
- C. Related Sections include the following:
 - 1. Section 102800, TOILET ACCESSORIES, for metal-framed mirrors.

1.02 DEFINITIONS

- A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.04 REFERENCED STANDARDS

- A. American Society for Testing and Materials International (ASTM):
 - 1. ASTM C1503-01, Specification for Silvered Flat Glass Mirror.
- B. Code of Federal Regulations (CFR):
 - 1. 16 CFR 1201-2006, Safety Standard for Architectural Glazing Materials.

SECTION 088300 – MIRRORS

- C. Glass Association of North America:
 - 1. Glazing Manual. Current Edition.
 - 2. Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors. Current Edition.

1.05 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For the following:
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
 - 2. Mirror mastic.
- C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- D. Samples: For each type of mirror product required, in the form indicated below:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror trim: 12 inches long.
- E. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.
- F. Qualification Data: For Installer.
- G. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing film and substrates on which mirrors are installed.
- H. Warranty: Special warranty specified in this Section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.

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- C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with the following published recommendations:
 - 1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 - 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- E. Safety Glazing Products: For film-backed mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
- F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing film and substrates on which mirrors are installed.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to City and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
 - 1. Warranty Period: Five years from date of Substantial Completion.

SECTION 088300 – MIRRORS

PART 2 - PRODUCTS

2.01 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Clear Glass Mirrors: ASTM C1503, Mirror Select Quality.
 - 1. Nominal Thickness: 6.0 mm.

2.02 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gunther Mirror Mastics.
 - b. Palmer Products Corporation.
 - c. Or approved equal
 - 2. VOC Content: Not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.03 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8- and 7/8-inch in height, respectively, and a thickness of not less than 0.04-inch.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8- and 1-inch in height, respectively, and a thickness of not less than 0.04-inch.
- B. Acceptable Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

SECTION 088300 – MIRRORS

1. Bottom Trim:
 - a. Laurence, C. R. Co., Inc.; CRL Standard “J” Channel.
 - b. Sommer & Maca Industries, Inc.; Medium Gauge Aluminum Shallow Nose “J” Moulding Lower Bar.
 - c. Or approved equal.
 2. Top Trim:
 - a. Laurence, C. R. Co., Inc.; CRL Deep “J” Channel.
 - b. Sommer & Maca Industries, Inc.; Medium Gauge Aluminum Deep Nose “J” Moulding Upper Bar.
 - c. Or approved equal.
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.04 FABRICATION

- A. Mirror Sizes: Cut mirrors to final sizes and shapes as indicated on the Drawings.
- B. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished edge.
 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Film-Backed Safety Mirrors: Apply film backing with pressure-sensitive adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections. Use adhesives and film backing compatible with mirror backing paint as certified by mirror manufacturer.

SECTION 088300 – MIRRORS

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
 - 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
 - 2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.02 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.03 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum air space of 1/8-inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. For wall-mounted mirrors, install mirrors with mastic and mirror hardware.
 - 1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 2. For mirror hardware in the form of continuous J-channels at top and bottom, provide setting blocks 1/8-inch-thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4-inch-wide by 3/8-inch-long.
 - 3. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8-inch between back of mirrors and mounting surface.

SECTION 088300 – MIRRORS

3.04 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION

SECTION 089000
LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Non-acoustical and acoustical exterior wall louvers. Refer to Mechanical Drawings for additional louver requirements.
 - 2. Gravity Vent at Elevator Shaft
- C. Related Sections:
 - 1. Section 042200, CONCRETE MASONRY UNIT, for installation of louvers in masonry walls.
 - 2. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING, for installation of gravity ventilator.
 - 3. Section 076200, SHEET METAL FLASHING AND TRIM, for sheet metal flashing.
 - 4. Section 079200, JOINT SEALANTS, for sealants installed in perimeter joints between louver frames and adjoining construction.
 - 5. Section 081113, HOLLOW METAL DOORS AND FRAMES, for louvers in steel doors.
 - 6. Section 081416, FLUSH WOOD DOORS, for louvers in wood doors.
 - 7. Division 23, HEATING, VENTILATING, AND AIR CONDITIONING, Sections for ductwork connections to louvers, and louvers and registers that are a part of mechanical equipment.

1.02 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

1.03 PERFORMANCE REQUIREMENTS

- 1. Structural Requirements: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and

SECTION 089000 – LOUVERS AND VENTS

under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

2. Wind Loads: Wind pressures shall be considered to act on vertical projection of louvers
 3. Determine loads based on a uniform pressure of 40-lbf/sq. ft., acting inward or outward.
 4. Design all materials to meet the requirements of the CBC for minimum 70-mph wind speed and for Zone C Exposure.
 5. Maximum allowable deflection for the louver structural members to be $l/180$ - or 0.75-inch, whichever is less. Maximum allowable deflection for the louver blades to be $l/120$ - or 0.50-inch across the weak axis, whichever is less.
 6. Provide engineering calculations to support design, and as follows:
 7. Calculations to be by a registered engineer licensed in California.
 8. Analysis of blade deflection to be limited to $L/120$, or 3/4-inch, whichever is less.
- B. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads."
1. Seismic Design Criteria: Refer to structural drawings.
 2. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 3. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 4. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 5. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.04 REFERENCED STANDARDS

1. Air Movement and Control Association International, Inc. (AMCA):
 - a. AMCA 500-L-99 Test Methods for Louvers, Dampers.
 - b. AMCA 501-93 Application Manual for Air Louvers.
2. American Architectural Manufacturers Association (AAMA):
 - a. AAMA 800 Voluntary Specifications and Test Methods for Sealants.
 - b. AAMA 2605-98 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
3. American Society for Testing and Materials International (ASTM):

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- a. ASTM B209-96 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- b. ASTM B221-96 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- c. ASTM D1187-97 Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
4. American Society of Civil Engineers (ASCE):
 - a. ASCE 7-98, Minimum Design Loads for Buildings and Other Structures.
5. American Welding Society (AWS):
 - a. AWS D1.2-97, Structural Welding Code – Aluminum.
6. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. Metal Finishes Manual for Architectural and Metal Products. Current Edition.
7. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - a. Architectural Sheet Metal Manual, Current Edition.

1.05 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTALS PROCEDURES.
- B. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- C. Shop Drawings: For louvers and accessories.
 1. Include plans, elevations, sections, details, and attachments to other Work.
 2. Show blade profiles, angles, and spacing.
- D. Samples for Verification: For each type of metal finish required.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following: AWS D1.2, "Structural Welding Code – Aluminum."

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- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor:
- B. Wall Louvers:
 - 1. Manufacturers:
 - a. Louvers as manufactured by Construction Specialties, Inc.
 - b. Or approved equal.
 - 2. 12-Inch-Deep Acoustical Wall Formed Aluminum Louvers:
 - a. Model # CS 12-inch-deep (304.8 mm) Sightproof Fixed Acoustical Louver Model A-12350.
 - 3. 4-Inch-Deep Wall-Formed Aluminum Louvers:
 - a. Model # A4177 – 4-inch (101.6 mm) High Performance Drainable Fixed Mullion Louver.
- C. Gravity Ventilators:
 - 1. Manufacturers:
 - a. Greenheck, Inc.
 - b. Or approved equal.
 - 2. Spun aluminum relief gravity ventilator:
 - a. Greenheck Model GRSR.
 - 3. General Description:
 - a. Ventilator: Low silhouette for relief applications with natural gravity or negative pressure system.
 - 4. Hood:
 - a. Constructed of aluminum.
 - b. Internal structure: constructed of galvanized steel.

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- c. Screen: 1/2-inch aluminum mesh. Mounted horizontally across the intake area of the hood.
- 5. Housing:
 - a. Curb Cap type: Hinged.
- 6. Roof Curbs:
 - a. Type: GPF.
 - b. Material: Aluminum.
 - c. Flashing Flange: 8-inch.
 - d. Coating Type: Permatector.
- 7. Dampers:
 - a. Type: Gravity.
 - b. Balanced for minimal resistance to flow.
 - c. Galvanized frames with prepunched mounting holes.
- 8. Finishes:
 - a. Type: Permatector,
 - b. Color: Bronzed Aluminum.

2.02 FABRICATION, GENERAL

- A. Assemble louvers and ventilators in factory to minimize field splicing and assembly.
 - 1. Disassemble units as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

SECTION 089000 – LOUVERS AND VENTS

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of louvers are to be installed in doors. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

- A. Locate and place louvers and ventilators level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Repair finishes damaged by cutting, welding, soldering, and grinding.
 - 1. Restore finishes so no evidence remains of corrective work.
 - 2. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- E. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200, JOINT SEALANTS, for sealants applied during louver installation.

3.04 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

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- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Engineer, remove damaged units and replace with new units.
- D. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

DIVISION 09
FINISHES

SECTION 091000
METAL SUPPORT SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Metal support system for suspended ceilings and exterior soffits.
 - 2. Metal support system for suspended ceiling and vibration isolation system at Generator Room.
- C. Related Sections:
 - 1. Section 061000, ROUGH CARPENTRY, for plywood to be attached to suspended soffit system.
 - 2. Section 072100, BUILDING INSULATION, for acoustical insulation for partitions and suspended ceilings
 - 3. Section 074243, VENTILATED COMPOSITE WALL PANELS AND SOFFITS, for suspension system for exterior soffits.
 - 4. Section 092900, GYPSUM BOARD, for partitions and ceilings.

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Select steel studs in accordance with the manufacturer's standard load tables for exterior ceiling and soffit assembly.
 - 2. Deferred/Design for Generator Room ceiling meeting manufacturer's requirements for vibration isolator spacing.

1.03 REFERENCES

- A. Reference Data:
 - 1. If the year of the adoption or latest revision is omitted from the designation, it shall mean the specification, manual or test designation in effect the date the Notice to Proceed with the Work is given.
- B. American Iron and Steel Institute (AISI):

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1. Specification for the Design of Cold-Formed Steel Structural Members, 1986.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A36, Specification for Structural Steel.
 2. ASTM A446, Specification for Weldless Carbon Steel Chain.
 3. ASTM A525, Specification for General Requirements for Steel Sheet, Zinc Coated, by the Hot Dip Process.
 4. ASTM A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 5. ASTM A570, Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
 6. ASTM A611, Specification for Steel, Cold-Rolled Sheet, Carbon, Structural.
 7. ASTM C645, Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
 8. ASTM C754, Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Baking Board, or Water-Resistant Backing Board, Standard Specification.
 9. ASTM E119, Method for Fire Tests of Building Construction and Materials.
- D. American Welding Society (AWI):
1. AWS D1, Structural Welding Code – Steel.
- E. Underwriters' Laboratories, Inc. (UL):
1. Fire Resistance Directory, Current Edition

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data:
1. Submit manufacturer's product specifications and installation instructions for each type of framing member, including structural properties.
- C. Shop Drawings:
1. Indicate stud construction, including soffit anchorage and backing systems.
 2. Indicate framing members, connections and relationship to adjacent material.
 3. Vibration Isolation system at generator room.

SECTION 091000 – METAL SUPPORT SYSTEMS

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. At fire rated construction, provide materials, accessories and application procedures that have been listed by UL or tested according to ASTM E119 for the construction type shown.
- B. Design Requirements:
 - 1. Framing members shall be designed in accordance with AISI specifications.
- C. Single Source Responsibility:
 - 1. Obtain framing components from a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General:
 - 1. Deliver materials in manufacturer's unopened containers or bundles fully identified with name, brand, type and grade.
 - 2. Protect metal from weather, corrosion and other damage. Store materials in a dry, well-ventilated space.
 - 3. Comply with manufacturer's written instructions for delivery, storage, and handling requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Ventilated Composite Soffit Suspension System:
 - 1. Manufacturer: USG Interiors, Inc.; Exterior Soffit Suspension System.

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2. Performance Requirements: Capable of supporting ceiling assembly indicated, with a maximum deflection of 1/360 of span.
 3. Main Channel: Cold-rolled steel channel, 1-1/2-inch, 16 gage, spaced maximum 4 feet o.c.
 4. Carrying Channel: Furring Channel, 7/8-inch, 25 gage, spaced maximum 2 feet o.c.
 5. Hanger Wire: Galvanized, 8 gage as specified below, spaced maximum 3 feet o.c.
 6. Metal Furring Channel Clip: Manufacturer's standard for this application.
 7. Provide seismic suspension strut bracing as required by Code.
- C. Backing Plates:
1. Sheet Steel: ASTM A61
 2. Steel Shapes: ASTM A36.
 3. Tubing ASTM A500, for sleeves through wall finish.

2.02 ACCESSORIES

- A. Furring Channels:
1. Manufacturer: Dietrich Industries, Inc., Toll Free (800) 775-2362.
 2. Material: Standard 25 gage galvanized steel, or as indicated.
 3. Miscellaneous Angles, Struts and Rough Hardware:
 4. Comply with ASTM C754.
- B. Hanger and Tie Wire:
1. Galvanized steel wire conforming to Federal Standard QQ-W-461, finish 5, class 1, soft temper.
 2. Hanger Wire: 8 gage.
 3. Diagonal Bracing Wire: 12 gage.
 4. Single-strand Tie Wire: 16 gage.
 5. Double-strand Tie Wire: 18 gage.
- C. Miscellaneous Clips and Fastenings:
1. Manufacturer's standard and as approved by governing authorities.
- D. Welding Materials:
1. Comply with the requirements of AWS.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. General:
1. Verify that conditions are satisfactory for installation of soffit framing.

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2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General Requirements:

1. Comply with the requirements of ASTM C754 for installation of framing to receive fiber cement panel.

3.03 VENTILATE COMPOSITE SOFFIT SUSPENSION SYSTEM

A. General:

1. Install in accordance with manufacturer's recommendations and as approved by governing authorities.
2. Space members as indicated on the Drawings, or if not indicated, as recommended by manufacturer and approved by governing authorities for the specified maximum deflection.
3. Securely anchor hangers to building structure and framing systems. Install special hangers as required where items above ceiling obstruct normal hanger wires.
4. Brace as indicated on Drawings, as recommended by system manufacturer and Reference Standards, and as required by governing authorities.
5. Lateral: Where suspension system supports partition loads, brace to support a lateral load of 5 lbs per square foot.
6. Screw-attach fiber cement panels in accordance with system manufacturer's recommendations and in compliance with governing authorities.

3.04 FIELD QUALITY CONTROL

A. Tolerances:

1. Ceilings: Install members to provide maximum deflection of L/360.

END OF SECTION

SECTION 092900

GYP SUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents:

1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

B. Section Includes:

1. Interior gypsum board and accessories.
2. Suspended Ceiling Framing System and Furring
3. Fiber-cement backing panels for solid-surface cladding for shower enclosure walls and ceilings.
4. Waterproof Membrane at Showers
5. Fiber-cement backing panels for ceramic tile in restrooms.

C. Related Sections:

1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for wall framing and ceiling framing.
2. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for solid-surfacing cladding at shower walls and ceilings.
3. Section 072100, BUILDING INSULATION, for thermal and sound insulation installed in assemblies that incorporate gypsum board.
4. Section 099123, INTERIOR PAINTING, for painted primers and finish coats applied to gypsum board surfaces.

1.02 REFERENCED STANDARDS

A. American National Standards Institute (ANSI):

1. ANSI A118.9-05, Test Methods and Specifications for Cementitious Backer Units.

B. American Society for Testing and Materials (ASTM):

1. ASTM A61, A36 and A500, Specification for metals.
2. ASTM B221-02, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
3. ASTM C36-01, Specification for Gypsum Wallboard.

SECTION 092900 – GYPSUM BOARD

4. ASTM C423-02a, Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 5. ASTM C475-02, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 6. ASTM C840-02, Specification for Application and Finishing of Gypsum Board.
 7. ASTM C1002-01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 8. ASTM C1047-99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 9. ASTM C1288-04, Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.
 10. ASTM C1325-04, Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.
 11. ASTM C1396-03, Specification for Gypsum Board.
 12. ASTM E84-03, Test Method for Surface Burning Characteristics of Building Materials.
 13. ASTM E90-02, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 14. ASTM E119-00a, Test Methods for Fire Tests of Building Construction and Materials
 15. ASTM E413-87, Classification for Rating Sound Insulation (Reapproved 1999)
- C. GA - Gypsum Association:
1. GA-216-04, Application and Finishing of Gypsum Board.
- D. National Gypsum Company:
1. Gypsum Construction Guide, Current Edition.
- E. USG Corporation:
1. The Gypsum Construction Handbook, Current Edition.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Samples: For the following products:
1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

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D. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5.1 and Credit MR 5.2: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Product Data for Credit EQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.
4. Laboratory Test Reports for Credit EQ 4: For adhesives used to laminate gypsum board panels to substrates, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.04 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 square feet in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install mockups for each level of gypsum board finish indicated for use in exposed locations.
 2. Apply or install final decoration indicated, including painting and wall coverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

SECTION 092900 – GYPSUM BOARD

- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Gypsum Board:
 - 1. G-P Gypsum.
 - 2. National Gypsum Company.
 - 3. USG Corporation.
 - 4. PABCO Gypsum
 - 5. Or approved equal.

2.02 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

- A. Soundproof Gypsum Board materials shall be manufactured by PABCO Gypsum, 37851 Cherry St., Newark, CA 94560; Phone: (800) 797-8159;

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Website: www.PABCOgypsum.com; Email: info@PABCOgypsum.com, or equal.

1. Soundproof Gypsum Board: QuietRock® 530, 5/8-inch-thick, Type X, fire rated.
 2. Provide at sleeping rooms, offices, gym, generator room ceiling and dayroom.
- B. Gypsum Board:
1. Standard: ASTM C36; or Fed. Spec. SS-L-30, Type III, Grade R, Class I; 5/8-inch-thick, tapered edges, ends square cut, maximum permissible lengths.
 2. Fire-rated: ASTM C36 Type X; or Fed. Spec. SS-L-30, Type III, Grade X, Class I; 5/8-inch-thick, tapered edges, ends square cut, maximum permissible lengths.
 3. Water-resistant: ASTM C630, 5/8-inch-thick, tapered edges, ends square cut, maximum permissible lengths.
 - a. Where water resistant, fire rated material is indicated, provide material which meets the requirements of both water resistant and fire rated gypsum wallboard.
 - b. Seal all edges per manufacturer's recommendations.
- C. General: Complying with ASTM C36 or ASTM C1396, as applicable to type of gypsum board indicated and whichever is more stringent.
- D. Provide Mold Resistant, Type X, 5/8-inch-thick panels with long edges tapered, unless otherwise indicated.
- E. Provide Moisture Resistant Type X, 1/2-inch-thick panels where abutting ceramic tile walls in restrooms and as noted on the finish schedule.

2.04 FIBER CEMENT BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9.
1. Acceptable Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. HardieBacker® 500 Cement Board with Moldblock™ Technology as manufactured by James Hardie Building Products, Inc., Sacramento, CA, Phone: (916) 501-7911, Attn: Brian Monahan; Website: www.jameshardie.com.
 - b. Custom Building Products; Wonderboard.
 - c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - d. USG Corporation; DUROCK Cement Board.
 - e. Or approved equal.
 2. Thickness: 1/2-inch, unless otherwise indicated on Drawings.

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- B. Waterproof Membrane:
 - 1. Manufacturers and Products: Design is based on the products of Laticrete International as a standard of quality. Substitutions will be considered under the provisions of Section 016000, PRODUCT REQUIREMENTS.
 - a. Standards: ANSI A118.10.
 - b. Products:
 - 1) Laticrete 9235 "Waterproofing Membrane," liquid membrane with reinforcing fabric.

2.05 METAL TRIM AND ACCESSORIES

- A. Interior Trim: ASTM C1047, galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet, including the following shapes:
 - 1. Cornerbead: Full metal shape.
 - 2. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - 3. L-Bead: L-shaped; exposed long flange receives joint compound.
 - 4. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - 5. Expansion (control) joint.
- B. Aluminum Trim:
 - 1. Extruded Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, alloy 6063-T5.
 - 2. Provide trim of profiles and dimensions indicated on the Drawings as manufactured by Pittcon Industries or approved equal.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
- C. Metal Furring Clips for Gypsum Board Cladding of Structural Steel Supports:
 - 1. Grabber® Fireproofing Column and Beam Drywall Clips as manufactured by Grabber Construction Products, Concord, CA, Phone: (800) 477-8876; Website: www.grabberman.com.
 - a. Clip Size: 2-3/8 inches wide by 2 inches high by 2 inches deep.
 - 2. Or approved equal.
- D. Channels for Shaft Liners:
 - 1. Grabber® Fireproofing Column and Beam Drywall Clips as manufactured by Grabber Construction Products, Concord, CA, Phone: (800) 477-8876; Website: www.grabberman.com.
 - a. Clip Size: 2-3/8 inches wide by 2 inches high by 2 inches deep.
 - 2. Or approved equal.
- E. Resilient Furring Channels for Acoustical Isolation:
 - 1. Hat shaped, 1/2-inch- deep members designed to reduce sound transmission.

SECTION 092900 – GYPSUM BOARD

- F. Interior Suspended Ceiling Framing System: Gypsum board ceiling Suspension System:
1. Ceiling Suspension System.
 - a. Performance Requirements: Capable of supporting ceiling assembly indicated, with a maximum deflection of 1/360 of span.
 - b. Main Channel: Cold-rolled steel channel, 1-1/2-inch, 16-gage, spaced maximum 4 feet o.c.
 - c. Carrying Channel: Furring Channel, 7/8-inch, 25-gage, spaced maximum 2 feet o.c.
 - d. Hanger Wire: Galvanized, 8-gage as specified below, spaced maximum 3 feet o.c.
 - e. Metal Furring Channel Clip: Manufacturer's standard for this application.
 - f. Provide seismic suspension strut bracing as required by Code.
 2. Backing Plates:
 - a. Steel gage, size, and configuration as shown on the Drawings.
 - b. Sheet Steel: ASTM A61
 - c. Steel Shapes: ASTM A36.
 - d. Tubing ASTM A500, for sleeves through wall finish.
 3. Accessories:
 - a. Furring Channels:
 - 1) Manufacturer: Dietrich Industries, Inc., Phone: (800) 775-2362.
 - 2) Material: Standard 25 gage galvanized steel, or as indicated.
 - 3) Miscellaneous Angles, Struts and Rough Hardware:
 - 4) Comply with ASTM C754.
 - b. Hanger and Tie Wire:
 - 1) Galvanized steel wire conforming to Federal Standard QQ-W-461, finish 5, class 1, soft temper.
 - 2) Hanger Wire: 8 gage.
 - 3) Diagonal Bracing Wire: 12 gage.
 - 4) Single-strand Tie Wire: 16 gage.
 - 5) Double-strand Tie Wire: 18 gage.
 - c. Miscellaneous Clips and Fastenings:
 - 1) Manufacturer's standard and as approved by governing authorities.
 - d. Welding Materials:
 - 1) Comply with the requirements of AWS.

2.06 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape for Interior Gypsum Wallboard: Cross-laminated, tapered edge, reinforced paper or fiberglass-mesh tape as recommended by setting type joint compound manufacturer.

SECTION 092900 – GYPSUM BOARD

- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Primer Finish Coat: USG Sheetrock First Coat.

2.07 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Fasteners: General: Comply with CCR, TITLE 24 – PART 2.
 - 1. Screws: USG "Type S" or "Type S-12," or equal; rust resistant, lengths per reference standards, and conforming to ASTM C1002.
 - 2. Nails: USG "Type GWB-54," or equal, annular ring, #120 1/2-gauge, rust resistant, lengths per reference standards, and conforming to ASTM C514.
- C. Thermal Insulation and Sound Attenuation Blankets: As specified in Section 072100, BUILDING INSULATION.
- D. Acoustical Sealant: As specified in Section 079200, JOINT SEALANTS.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

SECTION 092900 – GYPSUM BOARD

3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with GA-216 and ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels' not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Metal Framing: Install gypsum panels over metal framing, with floating internal corner construction.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

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3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

- B. Multilayer Application:
 - 1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 2. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - 3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.04 APPLYING CEMENTITIOUS BACKING PANELS

- A. Cementitious Backer Units: Comply with ANSI A108.11, at locations indicated.
- B. Where cementitious backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.05 INSTALLING CEILING SUSPENSION SYSTEM

- A. General:
 - 1. Install in accordance with manufacturer's recommendations and as approved by governing authorities.
 - 2. Space members as recommended by manufacturer and approved by governing authorities for the specified maximum deflection.
 - 3. Securely anchor hangers to building structure and framing systems. Install special hangers as required where items above ceiling obstruct normal hanger wires.

SECTION 092900 – GYPSUM BOARD

4. Brace as recommended by system manufacturer and Reference Standards, and as required by governing authorities.
5. Lateral: Where suspension system supports partition loads, brace to support a lateral load of 5 lbs per square foot.
6. Screw-attach gypsum board panels in accordance with system manufacturer's recommendations and in compliance with governing authorities.

3.06 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Engineer for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. Bullnose Bead: Use where indicated.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use where indicated.
 5. U-Bead: Use where indicated.
 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.07 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to GA-216 and ASTM C840:
 1. Level 1 Finish: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - a. Locations: Ceiling plenum areas, concealed areas, and where indicated.

SECTION 092900 – GYPSUM BOARD

2. Level 2 Finish: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges.
 - a. Locations: Panels that are substrate for acoustical tile.
 3. Level 3 Finish: Not used.
 4. Level 4 Finishes: Typical unless otherwise indicated.
 - a. For gypsum board to receive flat painted finish: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
 - b. For gypsum board to receive eggshell or semi-gloss painted finish: In addition to above, apply a full finish coat of USG First Coat, roller applied over entire wall surface. This finish coat is in addition to the painted primer coat specified in Section 099123, INTERIOR PAINTING.
 - c. Locations: Typical finish at gypsum board surfaces that will be exposed to view, unless otherwise indicated.
 5. Level 5 Finish: Not used.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions to receive specified shower enclosures and tile systems.

3.08 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 093000

CERAMIC TILE

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Wall tile installed using thin-set method.
 - 2. Metal trim.

1.02 RELATED SECTIONS

- A. Section 033000, CAST-IN-PLACE CONCRETE: Depressed structural floor slab.
- B. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS: Solid surface shower panel adjacent to tile.
- C. Section 092900, GYPSUM BOARD: Cementitious backer board and waterproofing.
- D. Section 102800, TOILET ACCESSORIES: Coordinate location of recessed accessories with tile layout and trim.

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A108 Series/A118 Series/A136.1, American National Standard Specifications for Installation of Ceramic Tile as appropriate to specified methods, including but not limited to the following:
 - 2. ANSI A108.1C, Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
 - 3. ANSI A108.5, Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - 4. ANSI A108.6, Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
 - 5. ANSI A108.9, Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

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6. ANSI A108.10, Installation of Grout in Tilework.
7. ANSI A118.1, Dry-Set Portland Cement Mortar.
8. ANSI A118.3, Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.
9. ANSI A118.4, Latex-Portland Cement Mortar.
10. ANSI A118.6, Ceramic Tile Grouts.
11. ANSI A118.7, Polymer Modified Tile Grouts for Tile installation.
12. ANSI A118.8, Modified Epoxy Emulsion Mortar/Grout.
13. ANSI A118.10, Load Bearing, Bonded Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation.
14. ANSI A137.1, Ceramic Tile.

- B. Tile Council of America (TCA):
1. Handbook for Ceramic Tile Installation.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Product Data: Submit instructions for using grouts.
- D. Samples: Submit four tiles for each type or color. Submit two samples for each type of grout.

1.05 CLOSEOUT SUBMITTALS

- A. Section 017700, CLOSEOUT PROCEDURES.
- B. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.

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- B. Installer: Company specializing in performing Work of this section.

1.08 REGULATORY REQUIREMENTS

- A. Comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG) for slip resistance (static friction coefficient) not less than 0.60 minimum per ASTM C1028.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000, PRODUCT REQUIREMENTS: Product storage and handling requirements.
- B. Protect adhesives and grouts from freezing or overheating.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000, PRODUCT REQUIREMENTS.
- B. Do not install adhesives and grouts in unventilated environment.
- C. Maintain ambient and substrate temperature of 50 deg F during installation of mortar materials.

1.11 EXTRA MATERIALS

- A. Section 016000, PRODUCT REQUIREMENTS: Spare parts and maintenance products.
- B. Supply 4 square feet of each size, color, and surface finish of tile specified.

PART 2 - PRODUCTS

2.01 TILE TYPES

- A. Available Manufacturers:
 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.

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3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Manufacturers and Products: The ceramic tile design is based on the products of Voguebay Mosaic & Tile Inc. as a standard of quality and appearance. Voguebay West Coast, 3004 Alvarado Street, Unit I, San Leandro, CA 94577; Phone: 510-357-0800.
- C. Type CT: “Durastone Porcelain Tile”:
1. Sizes: 12- x 24-inch and accent strips per interior elevation.
 2. Shape: Rectangular.
 3. Edge: Square.
 4. Moisture Absorption: Less than 10 percent per ASTM C373.
 5. Determination of Dimensions: ISO 10545-2.
 6. Breaking Strength: Greater than 500lbf per ASTM C648, ISO 10545-4.
 7. Slip Resistance:
 - a. Dry 0.76; Wet 0.45 Super-Polished.
 - b. Dry 0.66; Wet 0.51 Honed.
 - c. Dry 0.77; Wet 0.67 Matt.
 - d. Dry 0.91; Wet 0.75 Brushed.
 - e. Dry 0.77; Wet 0.67 Stream.
 - f. Stain Resistance: ASTM C1378 – Passed.
 8. Color/Style:
 - a. “Ash Grey” – combination of combed, matte polished and honed as determined in the field.
 - b. Refer to drawings for layout.

2.02 METAL TRIM TYPES

- A. Acceptable Manufacturer: Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. ASD. Phone: (800) 472-4588. Fax: (800) 477-9783. Email:specassist@schluter.com. Website: www.schluter.com.
- B. Finishing And Edge-Protection Profiles for Walls:
1. Schluter-QUADEC:
 - a. Description: Profile with square visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
 2. Corners:
 - a. Provide with matching inside corners.
 - b. Provide with matching outside corners.
 3. Base and Top:
 - a. Provide trim at bottom and top of tile.
 4. Material and Finish:
 - a. E – Stainless Steel Type 304 = V2A.

SECTION 093000 – CERAMIC TILE

2.03 MORTAR MATERIALS

- A. Manufacturers and Products: Design is based on the products of Laticrete International as a standard of quality. Substitutions will be considered under the provisions of Section 016000, PRODUCT REQUIREMENTS.
- B. Standards: ANSI 118, as appropriate to specified methods.
- C. Thin-Set Mortar (Bond Coat) for Tile Setting:
 - 1. Type TM-1: For standard ceramic floor and wall tile: ANSI A118.4 – Latex Portland Cement Mortar. Laticrete 211 "Crete Filler Powder" blended with Portland cement with Laticrete 4237 "Latex Thin-Set Mortar Additive."

2.04 GROUT

- A. Manufacturers and Products: Design is based on the products of Laticrete International as a standard of quality. Substitutions will be considered under the provisions of Section 016000, PRODUCT REQUIREMENTS.
- B. Standards: ANSI A118, as appropriate to specified products.
- C. Products – Walls:
 - 1. Walls: ANSI A118.3 – SPECTRALOCK PRO Premium Grout
 - 2. GT-2: Color To be selected from Premium Line

2.05 ACCESSORIES

- A. Protective Cover: Heavy duty, non-staining construction paper with compatible tape.
- B. Sealer: Penetrating type as approved by tile manufacturers for each tile type.
- C. Sealant: Polyurethane. Self-leveling for horizontal surfaces. Shore hardness greater than 35.
- D. Grout Release (to prevent staining of tile during installation of grout): Tile manufacturer's recommended product.

2.06 PATCHING AND LEVELING COMPOUND

- A. Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors.
- B. Have not less than the following physical properties:
 - 1. Compressive strength: 3500 psi.
 - 2. Tensile strength: 1000 psi.

SECTION 093000 – CERAMIC TILE

3. Flexural strength: 1000 psi.
 4. Density: 1.9.
- C. Capable of being applied in layers up to 2 inches thick, being brought to a feather edge and being troweled to a smooth finish.
- D. Ready for use 48 hours after application.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Division 01, General Requirements: Coordination and project conditions.
- B. Verify surfaces are ready to receive work.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. For thin-set installations, level substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION

- A. Install tile, and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Layout one full height of tile prior to affixing any units to confirm pattern height. Cut top and bottom tiles evenly to create a balanced pattern.
- D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly.
- E. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
 1. Walls: 1/16-inch.
- F. Sound tile after setting. Replace hollow sounding units.

SECTION 093000 – CERAMIC TILE

- G. Keep control joints free of adhesive or grout. Apply sealant to joints.
- H. Allow tile to set for a minimum of 48 hours prior to grouting.
- I. Grout tile joints.
- J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION – WALL TILE WITHOUT WATERPROOF MEMBRANE

- A. Over cementitious backer units install in general accordance with TCA Handbook Method W244.

3.05 CLEANING

- A. Section 017401, CLEANING.
- B. Remove all grout haze, observing tile manufacturer's recommendations as to use of acid or chemical cleaners. Do not use any type of petroleum-based products.
 - 1. Remove grout release material.
- C. Rinse tile thoroughly with clean water before and after chemical cleaners are used.
- D. Polish surface of tile with soft cloth.

3.06 SEALER

- A. Apply to Wall Tile:
 - 1. Do not apply until at least 10 days have elapsed after grouting.
 - 2. Before application, test sealer on samples of installed tiles to ensure no adverse effects; and to determine the quantity of coats required to protect individual tile types.
 - 3. Apply the required quantity of coats, minimum two. Remove excess sealer.
 - 4. Cure for minimum 24 hours.
- B. Protection of Installed Construction:
 - 1. Section 017300, EXECUTION: Protecting installed construction.
 - 2. Do not permit construction over finished surface for 5 days after installation.

END OF SECTION

SECTION 095113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Exposed metal suspension systems and acoustical lay-in panels, types and patterns as indicated on the Drawings; including, but not limited to the following:
 - a. 2-foot by 2-foot lay-in acoustical panels.
 - b. 2-foot by 4-foot lay-in acoustical panels.
- C. Related Sections include the following:
 - 1. Section 095426, LINEAR WOOD CEILINGS, for linear wood ceiling panels attached to metal suspension system.
 - 2. Section 122413, ROLLER WINDOW SHADES, for manually operated window roller shades.
 - 3. Section 230000, HEATING VENTILATION AND AIR CONDITIONING, for diffusers and ceiling mounted items.
 - 4. Section 265100, INTERIOR LIGHTING, for lighting fixtures and ceiling mounted items.

1.02 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
1. ASTM A641-03, Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 2. ASTM A653-08, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 3. ASTM B221-08, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 4. ASTM B633-07, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 5. ASTM C635-07, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 6. ASTM C636-07, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 7. ASTM C834-05, Specification for Latex Sealants.
 8. ASTM D3273-05, Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 9. ASTM E84-08a, Test Method for Surface Burning Characteristics of Building Materials.
 10. ASTM E90-04, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 11. ASTM E119-08a, Test Methods for Fire Tests of Building Construction and Materials
 12. ASTM E488-0, Test Method for Strength of Anchors in Concrete and Masonry Elements.
 13. ASTM E795-05, Practices for Mounting Test Specimens during Sound Absorption Tests.
 14. ASTM E1190-95, Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
 15. ASTM E1264-08, Classification for Acoustical Ceiling Products.
 16. ASTM E1512-01, Test Methods for Testing Bond Performance of Adhesive-Bonded Anchors.
- B. Ceilings and Interior Systems Construction Association:
1. Ceiling Systems Handbook.
 2. Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 and 4, 2004.
- C. Code of Federal Regulations (CFR):
1. 40 CFR 59, Subpart D-2008: National Volatile Organic Compound Emission Standards for Architectural Coatings.
- D. International Conference of Building Officials (ICBC):
1. CBC Standard 25-2: Metal Suspension Systems for Acoustical Tile and For Lay-in Panel Ceilings.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

- E. Underwriters Laboratories Inc. (UL):
 - 1. Fire Resistance Directory, Current Edition.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit for each type of product indicated:
 - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - 2. For sealants, including printed statement of VOC content.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/4-inch = 1 foot.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panels: Set of 6-inch-square samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long samples of each type, finish, and color.
- E. CALGreen Submittals
 - 1. Product Data Sheets and Declaration Statements showing compliance with CALGreen Code per 1.04.B.
- F. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. Product Data for Credit EQ 4.1: For sealants, including printed statement of VOC content.
- G. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- H. Maintenance Data: For finishes to include in maintenance manuals.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

1.05 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a “Certificate of Accreditation” and a “Scope of Accreditation” listing the test methods specified.
- B. Source Limitations:
 - 1. Ceiling Panels: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580.
 - 2. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's “Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies – Seismic Zones 3 and 4.”
 - 3. UBC Standard 25-2, “Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings.”
- E. Preinstallation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.08 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed for each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described in other Part 2 articles are basis of design products. Basis of design products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

2.02 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum percent by weight as indicated for each panel type.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E795.
- C. Acoustical Panel Colors and Patterns:
 - 1. Match appearance characteristics indicated for each product type.
 - 2. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E1264 and not manufacturers' proprietary product designations, provide products selected by Engineer from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment:
 - 1. Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273 and evaluated according to ASTM D3274 or ASTM G21.

2.03 ACOUSTICAL PANELS

- A. 2 x 4 Acoustical Lay-In Panels:
 - 1. Armstrong Fine Fissured Second Look II Tegular Lay-In:
 - a. Color: White (WH).
 - b. Edge Detail: Angled tegular, with reveal sized to fit 9/16-inch-wide flange of exposed suspension system members.
 - c. Thickness: 3/4-inch.
 - d. Size: 24 by 48 inches.
 - e. Humidity resistant with HumiGuard Plus.
- B. 2 x 2 Acoustical Lay-In Panels:
 - 1. Armstrong Fine Fissured Tegular Lay-In:
 - a. Color: White (WH).
 - b. Edge Detail: Angled tegular, with reveal sized to fit 9/16-inch-wide flange of exposed suspension system members.
 - c. Thickness: 3/4-inch.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

- d. Size: 24 by 24 inches.
- e. Humidity resistant with HumiGuard Plus.

2.04 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent, unless otherwise noted.
- B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes as indicated that comply with applicable requirements in ASTM C635.
 - 1. Main and cross runners roll formed from cold-rolled steel sheet, prepainted, hot-dip galvanized or electrolytically zinc coated according to ASTM A653, not less than G30 coating designation, with prefinished dimensional metal caps on flanges.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 0.106-inch-diameter wire.
- F. Seismic Components:
 - 1. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
 - 2. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
 - 3. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- G. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.05 METAL SUSPENSION SYSTEM FOR 2-FOOT X 4-FOOT and 2-FOOT x 2-FOOT ACOUSTICAL LAY-IN PANELS

- A. Armstrong 9/16-inch, Suprafine XL Exposed Tee Grid; Narrow-Face, Capped, Double-Web, Steel Suspension System, or approved equal:
 1. Structural Classification: Heavy-duty system.
 2. Cap Finishes: White (WH).

2.06 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling.
- B. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

3.03 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C636 and UBC Standard 25-2 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers' plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 6. When structural framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

SECTION 095113 – ACOUSTICAL PANEL CEILINGS

2. Screw-attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 2. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.04 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095426
LINEAR WOOD CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Interior and Exterior acoustical wood panel system with heavy-duty metal ceiling suspension system and all associated accessories and trim.
- B. Related Sections:
1. Section 230000, HEATING, VENTILATION, AND AIR CONDITIONING, for diffusers and ceiling mounted items.
 2. Section 265100, INTERIOR LIGHTING, for lighting fixtures and ceiling mounted items.
 3. Section 086200, UNIT SKYLIGHTS, for ceiling mounted skylight lens.
 4. Section 099123, INTERIOR PAINTING, for painting of ceiling plenum.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
1. ASTM A641-03, Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 2. ASTM A653-08, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 3. ASTM B221-08, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 4. ASTM B633-07, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 5. ASTM C635-07, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 6. ASTM C636-07, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

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7. ASTM E84-08a, Test Method for Surface Burning Characteristics of Building Materials.
 8. ASTM E119-08a, Test Methods for Fire Tests of Building Construction and Materials.
 9. ASTM E488-0, Test Method for Strength of Anchors in Concrete and Masonry Elements.
 10. ASTM E1190-95, Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
 11. ASTM E1264-08, Classification for Acoustical Ceiling Products.
 12. ASTM E1512-01, Test Methods for Testing Bond Performance of Adhesive-Bonded Anchors.
- B. Ceilings and Interior Systems Construction Association (CISCA):
1. CISCA Ceiling Systems Handbook.
 2. CISCA Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies – Seismic Zones 3 and 4, 2012.
 3. CISCA Wood Ceilings Technical Guidelines, Current Edition.
- C. Code of Federal Regulations (CFR):
1. 40 CFR 59, Subpart D-2016, National Volatile Organic Compound Emission Standards for Architectural Coatings.
- D. International Conference of Building Officials (ICBO):
1. California Building Code (CBC) Standard 25-2: Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings.
- E. Underwriters Laboratories Inc. (UL):
1. Fire Resistance Directory, Current Edition.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit for each type of product indicated and installation instructions:
1. For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
 2. For sealants, including printed statement of VOC content.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Panel grille lengths, placement of hangers, and ceiling suspension system members.
 2. Method of attaching hangers to building structure.

SECTION 095426 – LINEAR WOOD CEILINGS

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 4. Minimum Drawing Scale: 1/4-inch = 1 foot.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on samples of size indicated below.
1. Wood Strip Planks: 12-inch-square samples of wood strip panels, in the specified pattern, with specified finish applied.
 2. Suspension System Members, Moldings, and Trim: Set of 12-inch-long samples of each type, finish, and color.
 3. Acoustical Pads: 12-inch-square samples of insulation with black fabric covering.
- E. LEED Submittals:
1. Certificates for Credit MR 6 and Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 2. Include statement indicating costs for each certified wood product.
 3. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
1. The installer must be a firm with a minimum of 2 years of successful experience in installation of suspended wood ceilings of similar requirements to this project.
 2. Installer must be acceptable to the Engineer, manufacturer, and City's representative.
- B. Fire-Test-Response Characteristics:
1. Surface-Burning Characteristics: Provide wood ceiling boards and components with Class A surface-burning characteristics as determined by testing identical products per ASTM E84:
 2. Smoke-Developed Index: 450 or less.
- C. Environmental Standards: When required the wood ceiling shall originate from well managed forests as certified by accredited and recognized industry certifying organizations.

SECTION 095426 – LINEAR WOOD CEILINGS

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install linear wood plank ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Install when the temperature and humidity closely approximate the interior conditions that will exist when the building is occupied. Heating and cooling systems shall be operating before, during, and after installation; maintain humidity of the interior spaces between 25 percent and 55 percent.
- C. Plenums shall have proper ventilation, especially in high moisture areas. There shall be no excessive buildup of heat in the ceiling areas.
- D. Mechanical, electrical, and other utility service installations above the ceiling plane shall have been completed. No materials should rest against, or wrap around, the ceiling suspension components or connecting hangers.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Wood planks and components shall be delivered to the project site in original, unopened packages. Store flat and level in a fully enclosed space off the floor.
- B. Store wood planks for a minimum of 72 hours prior to installation, in the room which they will be installed. Temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied.
- C. Handle wood planks carefully to avoid chipping edges or damaging units in any way.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Products name or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.

SECTION 095426 – LINEAR WOOD CEILINGS

3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the Contractor.

2.02 SYSTEM BASIS OF DESIGN

- A. Manufacturer:
 1. Armstrong World Industries, Inc.
 2. Or approved equal.
- B. Interior Wood Planks: Woodworks Linear Veneered Planks, as manufactured by Armstrong World Industries:
 1. Surface Texture: Smooth.
 2. Composition: Fire-retardant Particle Board.
 3. Species/Finish: Natural Variations Light Cherry.
 4. Size: 4-1/2 inches x 96 inches.
 5. Reveal: Plank – 3/4-inch Reveal.
 6. Profile: Square.
 7. Edge Banding and Trim: To match face veneer.
 8. Noise Reduction Coefficient (NRC): 75.
 9. Flame Spread: ASTM E84 HPVA Fire Classification (Fire Class).
 10. Dimensional Stability: Standard.
 11. Sound-Absorbent Pads: BioAcoustic Infill Panel (Black - Matte).
- C. Ceiling Accessories (Ceilings) WoodWorks:
 1. 5687 - Backer Clip.
 2. 92715A620 - Self-tapping Screws.
 3. XL7321G90A – 2-Foot Exterior Cross Tee.
 4. XL7341G90A – 4-Foot Exterior Cross Tee.

2.03 SUSPENSION SYSTEM

- A. Manufacturer:
 1. Armstrong World Industries, Inc.
- B. Armstrong Prelude® XL, 15/16-inch-wide T-Bar suspension system with T-Bar hooks attached to panels. System assembly shall be per manufacturers requirements for the specified plank.
 1. Attach wood planks using manufacturer's dowel clips for connection to tee-grid carriers.
 2. Components include:
 - a. Main Beam and Cross Tees.
 - b. T-Bar Hooks.
 - c. Wood Screws.
 - d. Safety Cables.

SECTION 095426 – LINEAR WOOD CEILINGS

- e. Support Hangers.
- f. T-Bar Connector Clips.
- g. Splice Plates.

2.04 EDGES, BORDERS, AND PERIMETER TRIMS

- A. Product/Manufacturer:
 - 1. Axiom Trim Channel: Armstrong World Industries, Inc.
- B. Commercial quality extruded aluminum alloy 6063 trim channel, factory finished in baked polyester paint. Commercial quality galvanized steel unfinished T-bar connection clips; galvanized steel splice plates.
 - 1. Color: White.
- C. Axiom Trim Channel:
 - 1. 4-inch Axiom Classic Straight with inside and outside corners.

2.05 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing.
- B. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Factory finish wood planks panels in accordance with approved sample sets for color and sheen. Finish all four faces and ends.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ceiling Layout: Measure ceiling areas and establish layout of wood planks and tee-grid in accordance with manufacturer's installation instructions.
- B. Coordination: Contractor shall furnish the layout for supports that shall be installed for suspension of ceilings to existing wood framing, in time to coordinate the work.
 - 1. Contractor shall coordinate with other trades the location of devices which will penetrate the ceiling panels or interfere with the installation.
 - 2. Recessed or surface devices located within the ceiling panels are to be located and cut in the field.

SECTION 095426 – LINEAR WOOD CEILINGS

3.02 INSTALLATION

- A. General: The contractor shall install materials in accordance with manufacturer's printed instructions. The installation shall comply with applicable regulations and industry standards.
- B. Perimeters: Using a leveling device, lay out and install the perimeter trim as indicated.
- C. Suspension: The T-rail carriers shall be suspended and leveled to carry the panels per manufacturers allows loading criteria.
- D. Suspend wood planks from the T-rail carrier system using manufacturer's clips.
- E. HVAC and Light Fixture Suspensions: Electrical and mechanical installations must be supported independently of the wood ceiling.

3.03 ADJUSTMENT, CLEANING, AND REPAIR

- A. The contractor shall make final adjustments to level or contours.
- B. Upon completion of ceiling installation, all Planks and borders shall be cleaned free of dirt, dust, grease, oils, and fingerprints.
- C. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.04 INSPECTION

- A. Upon completion of ceiling installation, the City's Representative shall inspect all finished surfaces to ensure that work has been performed in a manner satisfactory to the City.
- B. Correct deficiencies in the installed ceiling at no additional cost to the City.

END OF SECTION

SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.
 - 3. Provide colors as scheduled on the Drawings to coordinate with paint colors.
- C. Related Sections:
 - 1. Section 033550, POLISHED CONCRETE FLOOR FINISHING, for walls/floors to receive rubber base.
 - 2. Section 033330, CONCRETE FLOOR HARDENER/SEALER, for walls/floors to receive rubber base.
 - 3. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for millwork to receive rubber base.
 - 4. Section 096566, RESILIENT ATHLETIC FLOORING, for resilient rubber tile flooring to receive rubber base.
 - 5. Section 096813, TILE CARPETING, for carpet tile flooring to receive rubber base.

1.02 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E648-03, Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - 2. ASTM F710-05, Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - 3. ASTM F1861-02, Specification for Resilient Wall Base
 - 4. ASTM F1869-04, Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - 5. ASTM F2170-02, Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

- B. Code of Federal Regulations (CFR):
 - 1. 40 CFR 59, Subpart D-2003, National Volatile Organic Compound Emission Standards for Architectural Coatings

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTALS PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.
- E. LEED Documentation:
 - 1. Provide data for LEED MR Credit 4 and MR Credit 5 for post-consumer and pre-consumer recycled content and location of extraction and manufacturing and distance from the project site.
 - 2. Provide Floorscore certification documentation for resilient base for LEED EQ c4.3 compliance.
 - 3. Provide VOC in grams per liter documentation for any base adhesives used for LEED EQ c4.1 compliance.

1.04 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.06 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.07 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If “No substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Resilient Base:
 1. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 2. Johnsonite.
 3. Roppe Corporation, USA.
 4. Or approved equal.
- C. Resilient Base Standard: ASTM F1861.
 1. Material Requirement: Type TP (rubber, thermoplastic).
 2. Manufacturing Method: Group I (solid, homogeneous).
 3. Style: Cove (base with toe) at concrete flooring and Straight (flat or toeless) at carpet.

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

- D. Attributes, Features, and Material Description:
1. Minimum Thickness: 0.125-inch.
 2. Height: 6 inches, typical and 4 inch at casework.
 3. Lengths: Coils in manufacturer's standard length.
 4. Outside Corners: Preformed.
 5. Inside Corners: Job formed or preformed.
 6. Color: "Charcoal WG" – Johnsonsite No. 20 or match.

2.02 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessories: Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 2. Flexco, Inc.
 3. Johnsonite.
 4. Roppe Corporation, USA.
 5. Or approved equal.
- B. Attributes, Features, and Material Description:
1. Material: Rubber.
 2. Profile and Dimensions: 6-inch-high base except at cabinet faces. 4-inch base at cabinet faces.
- C. Provide the follow and as indicated on the Drawings:
1. Carpet edge for glue-down applications.
 2. Nosing for carpet at concrete.
 3. Joiner for epoxy terrazzo and carpet.
 4. Transition strips.

2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Base and Accessories: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Inside Corners: Use straight pieces of maximum lengths possible.

3.04 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

3. Damp-wipe surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION

SECTION 096566

RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.01 SUMMARY

- A. The Work of the Section consists of furnishing all transportation, labor, materials, incidentals, and equipment necessary for construction and installation of athletic flooring, including all base installation, and all finishing and cleaning of surfaces.

1.02 SUBMITTALS

- A. Submit complete list of all materials included in this Section.
- B. Submit samples of each item and color available in the specified products from the proposed manufacturer.
- C. Extra Stock: Provide City representative with an additional 5 percent of each type of specified product in unopened packages for use in repairs or replacements.
- D. The VOC content of adhesives and sealants used must be less than the current VOC content limits of the SCAQMD Rule No. 1168, AND all sealants used as fillers must meet or exceed the requirements of the BAAQMD Regulation 8, Rule 51.
- E. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Data for Credit EQ 4.1: For installation adhesives, documentation including printed statement of VOC content and chemical components.
 - 3. Include documentation indicating compliance with "Floor Score Certified" for low-emitting materials.

1.03 PRODUCT HANDLING

- A. Delivery and Storage: Deliver materials to the Job Site and store in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers' recommendations.

SECTION 096566 – RESILIENT ATHLETIC FLOORING

- B. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed Work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the City.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Adhesives: As recommended by manufacturer which comply with the VOC limits noted above.
- B. Base: Refer to Section 096513, RESILIENT BASE AND ACCESSORIES. Install topset (cove) 6-inch-high rubber base, by Roppe, Burke, or approved equal. Color to be selected from complete line.
- C. Athletic Flooring (ATHL): Sport Impact flooring by Ecore Athletic. Website: ecoreathletic.com. Provide in 4-foot-wide roll, by length of room. Color and pattern as indicated.
 - 1. Prefabricated athletic rubber flooring, calendared and vulcanized with a base of natural and synthetic rubber, stabilizing agents and pigmentation, as manufactured by Ecore Athletic., or approved equal.
 - 2. Style: "Monster."
 - 3. Thickness: 22.5 mm.
 - 4. Color: Charcoal ES505.
 - 5. Finish: Smooth texture.
 - 6. Manufactured in two layers, which are vulcanized together. The shore hardness of the top layer will be greater than that of the bottom layer; shore hardness of layers to be recommended by the manufacturer and the limits specified.
- D. Floor Patching Compound/Underlayment: Latex type as recommended by the flooring manufacturer.
- E. Crack Filler: For concrete floor surfaces use non-shrinking cement mortar as recommended by flooring manufacturer
- F. Moisture Sealer: As recommended by manufacturers of flooring materials and selected by Installer to meet project circumstance and requirements where moisture content exceeds manufacturer's allowable limits. Cost of sealer shall be included in the Contractor's bid and installed even if project meets allowable moisture content.
 - 1. Sealer must comply with VOC limits noted above.

SECTION 096566 – RESILIENT ATHLETIC FLOORING

2.02 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation of the Work of this Section, shall be as recommended by the manufacturer of the resilient materials used.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which resilient flooring is to be placed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Surface shall be smooth, level, at the required finish elevation, without more than 1/8-inch in 10 feet variation from level or slopes shown.
- C. Alkalinity test and moisture test must be pre-formed. PH level should be in the range of 7 to 8.5. Moisture content must not exceed manufacturer's recommendations (verify using the calcium chloride test as per ASTM F1869).
 - 1. Apply sealer as specified even if tests meet manufacturer's allowed moisture content.

3.02 PREPARATION

- A. Subfloors: Prior to start of laying flooring, broom clean or vacuum all surfaces to be covered and inspect the subfloors. Start of installation will indicate acceptance of subfloor conditions.
 - 1. Install crack filler and floor patching compound as required to provide smooth subfloor prior to application of flooring.
- B. Concrete Primer: Apply concrete slab primer prior to application of the adhesive. Apply in compliance with manufacturer's directions.

3.03 RUBBER MAT INSTALLATION

- A. Clean substrate. Spread two-part epoxy adhesive evenly in quantity recommended by manufacturer to ensure adhesion over entire area. Spread only enough adhesive to permit installation of flooring before initial set.
- B. Set flooring in place per manufacturer's recommendations, press with heavy roller to ensure full adhesion.
- C. Hold all seams in place with suitable weights (concrete utility bricks 2-inch by 4-inch by 8-inch) for a minimum of 12 hours.

SECTION 096566 – RESILIENT ATHLETIC FLOORING

- D. Lay flooring with joints and seams parallel to building lines.
- E. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- F. Install edge strips at unprotected or exposed edges where flooring terminates and as indicated.
- G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- H. Install material for wall installation in similar manner and as recommended by the manufacturer.

3.04 BASE INSTALLATION

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. Use pre-molded sections for external corners and exposed ends.
- C. Install base on solid backing. Adhere tightly to wall and floor surface.
- D. Scribe and fit to door frames and other obstructions.
- E. Install straight and level to variation of plus or minus 1/8-inch over 10 feet (1/960).
- F. No gapping of material will be permitted. Base must be completely adhered to wall material.

3.05 CLEANING AND PROTECTION

- A. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners recommended by the flooring manufacturer. Protect installed flooring from damage until acceptance by the City representative.

3.06 FINISHING

- A. After completion of the Work and just prior to final inspection, thoroughly clean resilient flooring and accessories.

END OF SECTION

SECTION 096623
EPOXY TERRAZZO FLOORING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section includes:
 - 1. 3/8-inch Epoxy terrazzo with divider and accessory strips.
 - 2. Crack suppression mat.
 - 3. Vapor barrier.
 - 4. Moisture barrier.
 - 5. Precast terrazzo floor base.
- C. Related Requirements:
 - 1. Section 220000, PLUMBING: Coordinate installation of floor drains at epoxy terrazzo flooring.
 - 2. Section 033000, CAST-IN-PLACE CONCRETE: Concrete subfloor.
 - 3. Section 055000, METAL FABRICATIONS: Stair warning strip.
 - 4. Division 09, FINISHES. Adjacent Flooring Transitions: Provide surface hardware at epoxy terrazzo flooring.
 - 5. Section 092900, GYPSUM BOARD, and Section 093000, CERAMIC TILE: Backing for precast epoxy terrazzo base shall be 1/2-inch or greater thickness cement board, gypsum board or equivalent.
 - 6. Section 093000, CERAMIC TILE. Set metal base beads requiring installation prior to wall surface.

1.02 DEFINITIONS

- A. National Terrazzo and Mosaic Association, Inc. (NTMA).

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: The General Contractor shall conduct a conference at project site before Terrazzo Contractor begins installation.
 - 1. The General Contractor shall invite Terrazzo Contractor, the Architect and representatives of the Owner.

SECTION 096623 – EPOXY TERRAZZO FLOORING

2. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review terrazzo mixes and patterns.
 - d. Review custom terrazzo mixes, designs, and patterns.
 - e. Coordination with the work of other installers.

1.04 ACTION SUBMITTALS

- A. Product Data: Terrazzo Contractor shall submit Product Data for each type of product required for installation including:
 1. Strip materials.
 2. Crack Suppression mat materials
 3. Vapor and moisture barrier materials.
 4. Primer.
 5. Sealer.
- B. LEED Submittals: Terrazzo Contractor shall submit the following:
 1. Product Data for Credit MR 4: For products having recycled content, submit documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
 - a. Include statement indicating cost for each product having recycled content.
 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, submit documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
 - a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
 3. Product Data for Credit IEQ 4.1: For adhesives, submit documentation including printed statement of VOC content.
 4. Product Data for Credit IEQ 4.3: For sealers, submit documentation including printed statement of VOC
- C. Shop Drawings: Terrazzo Contractor shall prepare and submit Shop Drawings that include plans, elevations, sections, component details and attachments to other work. Include terrazzo installation requirements. Show layout of the following:
 1. Divider strips.
 2. Expansion joint strips.
 3. Accessory strips.
 4. Base layout.

SECTION 096623 – EPOXY TERRAZZO FLOORING

- D. Samples:
 - 1. Terrazzo Contractor shall prepare and submit a maximum of three samples, sizes 12 by 12 inches for each color and type of terrazzo specified.
 - 2. Terrazzo Contractor shall submit three samples, 12 by 12 inches for each color and type of precast terrazzo specified.
- E. Samples for Initial Selection: Refer to Schedule at end of PART 3 of this Specification.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Terrazzo Contractor shall submit two copies of qualification data:
 - 1. Include list of projects indicating name and location of project, name of Owner, name and contact information for General Contractor, and name and contact information for Architect.
 - 2. Include letter from NTMA with the name of the Project and name of member, stating current member status.
- B. Material Certificates:
 - 1. Epoxy Resin: For each type of resin required indicating that materials meet specification requirements, by manufacturer.
 - 2. Aggregate: For each type of aggregate required indicating compatibility with terrazzo mix, signed by aggregate supplier.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Literature: Terrazzo Contractor shall submit two copies of maintenance recommendations from NTMA.

1.07 QUALITY ASSURANCE

- A. Acceptable Epoxy Resin Manufacturer: An Associate Member of the NTMA, experienced in manufacturing epoxy resin in accordance with NTMA standards and with a record of successful in-service performance, as well as sufficient production capacity to produce required materials.
- B. Acceptable Terrazzo Contractor: A Contractor Member of NTMA whose work has resulted in construction with a record of successful in-service performance.
 - 1. Installer shall have completed terrazzo installations within the past 5 years of scale and complexity similar to the proposed installation.
- C. Source Limitations for Aggregates: Terrazzo Contractor shall obtain each color, grade, type and variety of granular materials from sources with resources to provide materials of consistent quality in appearance and physical properties.

SECTION 096623 – EPOXY TERRAZZO FLOORING

- D. Mockups: Terrazzo Contractor shall construct mockup in the field to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup at location to be determined.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE. AND HANDLING

- A. Materials shall be delivered to Project site in supplier's original wrappings and containers, labeled with source or manufacturer's name, material or product brand name, and lot number if any.
- B. Materials shall be stored in their original, undamaged packages and containers, in a location where they will not be exposed to direct sunlight.
 - 1. Epoxy components shall be stored in a space where the ambient temperature can be maintained 60 and 90 deg F before use.

1.09 PROJECT CONDITIONS

- A. General Contractor shall provide sufficient water, temporary heat and light, and adequate electric power with suitable outlets connected and distributed for use within 100 feet of any working space.
- B. General Contractor shall provide temporary enclosures and other suitable methods to protect adjacent spaces from damage during installation.
 - 1. Maintain ambient temperatures in the area to receive terrazzo at not less than 60 deg F.
 - 2. Maintain adequate ventilation in the area to receive terrazzo.
- C. Terrazzo Contractor shall protect other adjacent work from water and dust generated by grinding operations.

1.10 GUARANTEE

- A. One year from date of Substantial Completion.

SECTION 096623 – EPOXY TERRAZZO FLOORING

PART 2 - PRODUCTS

2.01 PERFORMANCE

A. Epoxy Resin:

1. Test Specimens: Mix resin materials according to manufacturer's recommendation without aggregate added and cure for 7 days at 75 deg F plus or minus 2 deg F and 50 percent plus/minus 2 percent relative humidity.
2. Cured test specimens shall meet or exceed the following requirements:
 - a. Hardness: 60 to 85 per ASTM D2240, Shore D.
 - b. Minimum Tensile Strength: 3000 psi per ASTM D638 for a 2-inch specimen made using a "C" die per ASTM D412.
 - c. Minimum Compressive Strength: 10,000 psi per ASTM D695, Specimen B cylinder.
 - d. Chemical Resistance: No deleterious effects by contaminants listed below after 7-day immersion at room temperature per ASTM D1308.
 - 1) Distilled Water.
 - 2) Mineral Water.
 - 3) Isopropanol.
 - 4) Ethanol.
 - 5) Soap solution at 1 percent.
 - 6) Sodium hydroxide at 10 percent solution.
 - 7) Hydrochloric acid at 10 percent solution.
 - 8) Hydrochloric acid at 30 percent solution.
 - 9) Detergent Solution at 0.025.
 - 10) Acetic Acid at 5 percent solution.

B. Epoxy Resin with Aggregate:

1. Test Specimens:
 - a. Mix epoxy resin according to manufacturer's recommendations and blend one volume of epoxy resin with three volumes of marble aggregate, consisting of:
 - 1) 60 percent No. 1 chip.
 - 2) 40 percent No. 0 chip.
 - b. Grind and grout with epoxy resin finished to a nominal 3/8-inch thickness.
 - c. Cure specimens 7 days at 75 deg F plus/minus 2 deg and 50 percent plus/minus 2 percent relative humidity.
2. Cured epoxy terrazzo specimens shall nominally meet the following requirements:
 - a. Flammability: Self-extinguishing, extent of burning 1/4-inch maximum according to ASTM D635.
 - b. Coefficient of Linear Thermal Expansion: 0.000025 inch/inch per deg F per ASTM C531.

SECTION 096623 – EPOXY TERRAZZO FLOORING

- C. Bond Strength of Epoxy Terrazzo: 300 lb failure according to field test method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin.

2.02 MATERIALS

- A. Epoxy Resin Matrix: Two-component, high solids product complying with specified performance requirements.
 - 1. Color: As required for mix indicated.
- B. Primer: As recommended, manufactured and supplied by epoxy resin manufacturer.
- C. Aggregates: Marble, glass, synthetics and metal.
 - 1. Comply with NTMA gradation standards.
 - 2. Abrasion and Impact Resistance: Loss of 40 percent or less when tested according to ASTM C131 (LA Abrasion).
 - 3. Aggregates shall contain no deleterious or foreign matter.
- D. Divider Strips:
 - 1. Material: Stainless Steel.
 - 2. Strip Thickness: 16 gauge.
 - 3. Type: "L" strip: 3/8-inch by 1/2-inch.

2.03 PRECAST TERRAZZO

- A. Precast Terrazzo Base: Minimum 3/8-inch-thick, epoxy terrazzo units cast in maximum lengths possible, but not less than 36 inches. Comply with precast manufacturer's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
 - 1. Type: Coved with minimum 3/4-inch radius.
 - 2. Top Edge: Beveled with polished top surface.
 - 3. Outside Corner Units: With finished returned edges or mitered at outside corner.
 - 4. Color, Pattern, and Finish: Match adjacent poured-in-place terrazzo flooring field.
- B. Moisture Mitigation: Contractor shall install two-component, high solids, moisture tolerant, high density, low odor, epoxy-based product produced by epoxy terrazzo resin manufacturer over concrete sub-base/slab to reduce alkalinity levels and moisture emission to not more than 3 lbs/1,000 sq. ft. per 24 hours. Cost of moisture mitigation shall be included in the Contractor's bid and installed even if project meets allowable moisture content.
- C. Crack Suppression/Isolation Membrane: Contractor shall install isolation membrane, over concrete sub-base/slab, produced and supplied by approved

SECTION 096623 – EPOXY TERRAZZO FLOORING

terrazzo resin formulator, having minimum 120 percent elongation potential per ASTM D412.

- D. Primer: As recommended, manufactured and supplied by epoxy resin manufacturer
- E. Setting Materials for Precast Terrazzo:
 - 1. Epoxy Adhesive: Two component, compatible with terrazzo units and substrate, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.04 MISCELLANEOUS ACCESSORIES

- A. Sealer: Terrazzo Contractor shall provide a non-ambering, clear sealer that is chemically neutral; does not impair terrazzo aesthetics or physical properties; is recommended by terrazzo matrix manufacturer. Sealers shall comply with the following:
 - 1. Comply with requirements of authorities having jurisdiction.
 - 2. Comply with ASTM D2047.
 - 3. Water Based Sealer Properties: With pH factor between 7 and 10.
 - 4. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.05 MIXES

- A. Terrazzo Selection: Terrazzo Contractor shall provide standard terrazzo mix(es) according to the following:
 - 1. NTMA Epoxy Series 4: EP4-84.
- B. Proportions for Epoxy Terrazzo Topping: Comply with resin supplier's recommendations.
- C. Mixing of Terrazzo Topping: Mix epoxy components with aggregates in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The General Contractor and Architect shall examine substrates and areas, with Terrazzo Contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
 - 1. Slab Flatness Tolerance: Subfloor is not to vary more than 1/4-inch from true plane in a 10-foot span.

SECTION 096623 – EPOXY TERRAZZO FLOORING

2. Cracks: Locate cracks and joints in concrete substrates. Verify location of control joints and expansion joints in epoxy terrazzo flooring.
 - a. The Terrazzo Contractor shall install a crack suppression membrane to prevent cracks in concrete substrates transmitting through epoxy terrazzo flooring.
- B. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to epoxy resin manufacturer's written instructions.
 1. Contractor shall perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 2. Contractor shall perform anhydrous calcium chloride test, ASTM F1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
 3. The Contractor shall be responsible for correcting non-conforming concrete substrates using materials compatible with epoxy terrazzo flooring system and as approved by the Terrazzo Contractor. Slab substrates must be dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by epoxy terrazzo manufacturer. If moisture levels do not meet manufacturer recommendations for specified installation, the contractor at no cost to the Owner shall seal the floor to allow the installation to proceed.
 4. Materials used to correct nonconforming conditions must be compatible with the selected epoxy system and be approved by the manufacturer of epoxy resin materials and Terrazzo Contractor.

3.02 PREPARATION

- A. General Contractor shall broom clean area to receive terrazzo to remove loose chips and all foreign matter.
- B. Terrazzo Contractor shall install moisture mitigation materials.
- C. Terrazzo Contractor shall install flexible epoxy crack isolation/suppression membrane.

3.03 POURED-IN-PLACE TERRAZZO INSTALLATION

- A. Strip Materials: Terrazzo Contractor shall install strip materials as follows:
 1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated.
 - b. Install control joint strips back-to-back in locations indicated.
 - c. Install strips in epoxy adhesive without voids below strips.

SECTION 096623 – EPOXY TERRAZZO FLOORING

- B. Placing Terrazzo:
 - 1. Prime subfloor in accordance with manufacturer's recommendations.
 - 2. Proportion and thoroughly blend the materials.
 - 3. Place mixture to achieve specified thickness.
 - 4. Abrasive Strips: Install with surface of abrasive strip positioned 1/16-inch higher than terrazzo surface.

- C. Finishing: Terrazzo Contractor shall finish the terrazzo topping as follows:
 - 1. Rough Grinding:
 - a. Grind with 24 or finer grit stones or with comparable diamond abrasives.
 - b. Follow initial grind with 60/80 grit stones or with comparable diamond abrasives.
 - 2. Grouting:
 - a. Clean terrazzo with clean water and rinse. Allow to dry.
 - b. Apply epoxy grout per manufacturer's instructions.
 - c. Allow grout to cure.
 - 3. Fine Grinding/Polishing: Grind with 120 grit or with comparable diamond abrasives until all grout is removed from surface.

- D. Terrazzo Cleaning: Terrazzo Contractor shall clean finished terrazzo as follows:
 - 1. Remove grinding residue from terrazzo surface.
 - 2. Wash terrazzo surfaces immediately after final grinding of terrazzo flooring with water and allow surfaces to dry thoroughly.

- E. Sealing: Terrazzo Contractor shall seal terrazzo according to sealer manufacturer's written instructions.

3.04 PRECAST TERRAZZO INSTALLATION

- A. Terrazzo Contractor shall install precast terrazzo units as follows:
 - 1. Precast Terrazzo Base: Use water-cleanable, tile-setting epoxy to install precast terrazzo base over substrates indicated according to ANSI 108.5.

3.05 REPAIR

- A. Terrazzo Contractor shall repair terrazzo areas that evidence lack of bond between topping and under-bed according to NTMA's written recommendations.

3.06 PROTECTION

- A. After application of the sealer, the Work shall be ready for final inspection and acceptance by the Owner or his agent.

SECTION 096623 – EPOXY TERRAZZO FLOORING

- B. The General Contractor shall protect the finished floor after the Terrazzo Contractor has completed final grinding and applied sealer to terrazzo surfaces.

END OF SECTION

SECTION 096813

TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Carpet tile, free-lay installation with adhesive corner patches.
 - 2. Substrate sealant.
- C. Related Sections:
 - 1. Section 096513, RESILIENT BASE AND ACCESSORIES, for resilient wall base and accessories installed with carpet tile.
 - 2. Section 096623, EPOXY TERRAZZO FLOORING, for accessories at flooring transitions.

1.02 REFERENCED STANDARDS

- A. The American Association of Textile Chemists and Colorists (AATCC):
 - 1. AATCC 16-98, Colorfastness to Light.
 - 2. AATCC 24-99, Resistance of Textiles to Insects.
 - 3. AATCC 134-01, Electrostatic Propensity of Carpets.
 - 4. AATCC 165-99, Colorfastness to Crocking: Carpets – AATCC Crockmeter Method.
 - 5. AATCC 174-98, Antimicrobial Activity Assessment of Carpets.
- B. American Society for Testing and Materials International (ASTM):
 - 1. ASTM C423-02a, Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 2. ASTM D1335-98, Test Method for Tuft Bind of Pile Yarn Floor Coverings.
 - 3. ASTM D2646-96, Test Methods for Backing Fabric Characteristics of Pile Yarn Floor Coverings.
 - 4. ASTM D3936-02, Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.
 - 5. ASTM D5116-97, Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

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6. ASTM D6859-03, Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings.
 7. ASTM E648-03, Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 8. ASTM F710-98, Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
 9. ANSI/NSF 140, Sustainability Assessment for Carpet.
- C. The Carpet and Rug Institute (CRI):
1. CRI 104-02, Standard for Installation Specification of Commercial Carpet.
- D. International Organization for Standardization (ISO):
1. ISO 2551 (Aachen Test)-81, Machine-Made Textile Floor Coverings – Determination of Dimensional Changes in Varying Moisture Conditions.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
1. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- C. LEED Submittals:
1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 2. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost, location of manufacturer, and distance to Project for each regionally manufactured material.
 3. Product Data for Credit EQ 4.1: For installation adhesives, documentation including printed statement of VOC content and chemical components.
 4. Include documentation indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
- D. Shop Drawings: Show the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 2. Carpet tile type, color, and dye lot.
 3. Type of subfloor.
 4. Type of installation.
 5. Pattern of installation.
 6. Pattern type, location, and direction.

SECTION 096813 – TILE CARPETING

7. Pile direction.
 8. Type, color, and location of insets and borders.
 9. Type, color, and location of edge, transition, and other accessory strips.
 10. Transition details to other flooring materials.
- E. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long samples.
- F. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- G. Qualification Data: For Installer.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- I. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- J. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.06 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

SECTION 096813 – TILE CARPETING

- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with sealant and adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.07 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 3. Manufacturers Material Warranty: Lifetime Commercial Limited Warranty.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 square yards.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Manufacturers of materials are listed to set a standard for design and product performance.
 - 2. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided they are equal in design, product performance, and warranty to the products specified.
 - 3. The burden of proof of equality of the proposed products is on the Contractor.
 - 4. If "No Substitutions" is indicated next to the product name, provide product indicated.

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- B. Carpet Tile:
 - 1. As manufactured by Shaw Contract Group; Phone: (800) 257-7429, Website www.shawcontract.com, or approved equal.

2.02 CARPET TILE

- A. Carpet Tile Description:
 - 1. Carpet Type: Modular tile.
 - 2. Collection: Design Journey
 - 3. Style Name: Plain Weave Tile.
 - 4. Style No.: 5T098.
 - 5. Color: Traditional, 99496.
 - 6. Construction: Multi-level pattern cut/loop.
 - 7. Fiber: Eco solution q100® nylon.
 - 8. Dye method: 43 percent solution dyed / 57 percent yarn dyed.
 - 9. Tufted weight: 38.0 oz.
 - 10. Gauge: 1/10.
 - 11. Stitches per inch: 10.
 - 12. Finished pile thickness: 0.111.
 - 13. Total thickness: 0.314.
 - 14. Average density: 12324.
 - 15. Product size: 24 inches x 24 inches.
 - 16. Backing: Ecoworx® tile.
 - 17. Protective treatments: Ssp® shaw soil protection.
 - 18. Installation Method: Ashlar Pattern with dot adhesive for easy removal.

2.03 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.
- B. Primer: Non-silicone-based sealer as recommended by manufacturer.
- C. Attachment Method: Shaw Contract “LokDots” adhesive patches.

2.04 SUBSTRATE SEALANT

- A. Substrate sealant compatible and as recommended by flooring manufacturer to seal concrete substrate against moisture intrusion so that moisture vapor emission is with allowable tolerances for specified installation. Cost of sealer shall be included in the Contractor’s bid and installed even if project meets allowable moisture content.

SECTION 096813 – TILE CARPETING

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710.
 - 1. Slab substrates must be dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer. If moisture levels do not meet manufacturer recommendations for specified installation, the contractor at no cost to the Owner shall seal the floor to allow the installation to proceed.
 - 2. Verify that the subfloor finishes comply with requirements specified in Section 033000, CAST-IN-PLACE CONCRETE, for slabs receiving carpet tile.
 - 3. Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Adhesive Material:
 - 1. Do not store LokDots at temperatures exceeding 120 deg F.
 - 2. LokDots are freeze-thaw stable; however, LokDots must be allowed to acclimate to site conditions of 65 deg F prior to application.
 - 3. The following conditions must be maintained for 24 hours prior to, during and after installation:
 - a. HVAC System: Must be operational maintaining the following conditions.
 - b. Temperature: The installation site, carpet and adhesive must be between 65 deg F and 95 deg F. Do not begin the installation if the subfloor temperature is below 50 deg F.
 - c. Humidity: The installation site's ambient relative humidity must not exceed 65 percent.
 - d. Moisture: Conduct relative humidity testing. Results must be below 95 percent (ASTM F2170) or the Anhydrous Calcium Chloride test must not exceed 10.0 lbs. per 1000 SF per 24 hours ASTM F1869 test).
 - e. Alkalinity: Conduct pH testing on the floor in several locations. A reading below 5.0 or above 12.0 (ASTM F710) requires corrective measures. Do not begin the installation if an unacceptable moisture level is detected

SECTION 096813 – TILE CARPETING

3.02 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8-inch-wide or wider and protrusions more than 1/32-inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Mop, broom and vacuum clean substrates to be covered immediately before installing sealant and carpet tile.
- E. Apply sealant to maintain proper PH and moisture levels (SHAW 9000 or 9050 as appropriate).
- F. Prime floor as recommended with manufacturer's primer.

3.03 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Free-lay with adhesive patches at corners; lay in quarter turn pattern.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- G. Install pattern parallel to walls and borders.

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3.04 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.

- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 097723

FABRIC-WRAPPED PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Fabric-wrapped tackable/acoustical panels, sizes and locations as indicated on the Drawings.
- B. Related Sections:
 - 1. Section 095113, ACOUSTICAL PANEL CEILINGS, for acoustical panel ceilings installed for noise reduction.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C553-00, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - 2. ASTM C612-00a, Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 3. ASTM C665-01, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 4. ASTM E84-01, Test Method for Surface Burning Characteristics of Building Materials.
- B. Code of Federal Regulations (CFR):
 - 1. 40 CFR, Part 59, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
- C. International Conference of Building Officials (IBC):
 - 1. IBC Standard 8-1-97, Test Method for Surface-Burning Characteristics of Building Materials.

SECTION 097723 – FABRIC-WRAPPED PANELS

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of panel edge, core material, and mounting indicated.
- C. CALGreen Submittals:
 - 1. Product Data Sheets and Declaration Statements showing compliance with CALGreen Code per 1.04.B.
- D. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost, location of manufacturer, and distance to Project for each regionally manufactured material.
 - 3. Product Data for Credit EQ 4.1: For installation adhesives, documentation including printed statement of VOC content and chemical components.
 - 4. Product Data for Credit EQ 4.4: For composite wood products used in fabric-wrapped wall panels, documentation indicating that product contains no urea formaldehyde.
- E. Shop Drawings:
 - 1. Indicate panel edge and core materials.
 - 2. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections.
 - 3. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
 - 4. Coordination Drawings: Show intersections with doors, electrical outlets and switches, thermostats, lighting fixtures, air outlets and inlets, speakers, sprinklers, access panels, and other adjacent work.
- F. Samples for Initial Selection: For each type of fabric facing material from fabric-wrapped panel manufacturer's full range.
- G. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.
 - 1. Fabric: Full-width by 36-inch-long Sample from dye lot to be used for the Work.
 - 2. Panel Edge: 12-inch-long Sample showing edge profile, corner, and finish.
 - 3. Core Material: 12-inch-square Sample showing corner.
 - 4. Mounting Device: Full-size Sample.

SECTION 097723 – FABRIC-WRAPPED PANELS

- 5. Sample Panels: No larger than 36 by 36 inches. Show joints and mounting methods.
- H. Qualification Data: For fabricator.
- I. Maintenance Data: For fabric-wrapped panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.
- J. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations: Obtain fabric-wrapped panels through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide fabric-wrapped panels with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and fabric-wrapped panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
- C. Protect panel edges from crushing and impact.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fabric-wrapped panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

SECTION 097723 – FABRIC-WRAPPED PANELS

- B. Lighting: Do not install fabric-wrapped panels until a lighting level of not less than 50 fc is provided on surfaces to receive fabric-wrapped panels.
- C. Air-Quality Limitations: Protect fabric-wrapped panels from exposure to airborne odors such as tobacco and smoke and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of fabric-wrapped panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped panels that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Lamvin, Wall Technology, or Decoustics; or approved equal for panel core.
 - 2. Guilford of Maine for facing Material; or approved equal.
 - 3. Provide panels at locations as indicated on the drawings.
- B. Facing Material: Fabric from same dye lot; color and pattern as indicated below
 - 1. Manufacturer: Guilford of Maine Panel Fabric, A True Textiles Inc. Brand.
 - 2. Style: Anchorage 2335.
 - 3. Color: Architect to select from entire Anchorage color line.
 - 4. Width: 66 inches.
 - 5. Applied Treatments: Stain resistance, polymer flame resistance.
 - 6. Fabric Application: Railroad.
- C. Panel Core: Provide the following core material:
 - 1. Lamvin: Sonic Tackable High Impact Panel
 - 2. Composition and Thickness:
 - a. Core to consist of a 6 to 7 lb density rigid fiberglass board layered with a 1/8-inch-high density 10 to 20 lb fiberglass sheet. Resin hardened edges to reinforce panel perimeter against warping and damage.
 - b. Thickness: 1-1/8 inches.

SECTION 097723 – FABRIC-WRAPPED PANELS

3. Fire Test: All components are ASTM E84 – Class I/A Hardened edge.
- D. Panel Width and Height: As indicated on Drawings.
- E. Panel Edge: Resin-hardened, glass-fiber board.
 1. Edge Detail: Square.
 2. Corner Detail: Square to form continuous profile to match edge detail.

2.02 FABRICATION

- A. Fabric-Wrapped Panels: Panel construction consisting of facing material adhered or attached to face, edges, and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.
 1. Core Material: Resin harden areas of core for attachment of mounting devices.
- B. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.
 1. Where square corners are indicated, tailor corners.
 2. Where fabrics with directional or repeating patterns or directional weave are indicated, mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.
- C. Dimensional Tolerances of Finished Units: Plus or minus 1/16-inch for the following:
 1. Thickness.
 2. Edge straightness.
 3. Overall length and width.
 4. Squareness from corner to corner.
- D. Mounting Devices: Concealed on back of panel, recommended to support weight of panel, with base-support bracket system where recommended by manufacturer for additional support of panels, and as follows:
 1. Metal "Z" Clips: Two-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to allow for panel removal.

SECTION 097723 – FABRIC-WRAPPED PANELS

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine fabric, substrates, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of fabric-wrapped panels.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Wall Panels: Install fabric-wrapped panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with fabric-wrapped panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.
- C. Match and level fabric pattern and grain among adjacent panels.
- D. Installation Tolerances: As follows:
 - 1. Variation from Plumb and Level: Plus or minus 1/16-inch.
 - 2. Variation of Panel Joints from Hairline: Not more than 1/16-inch-wide.

3.03 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.

3.04 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that fabric-wrapped panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Engineer, before time of Substantial Completion.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Steel (high performance coatings).
 - 3. Galvanized and non-galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Provide colors as scheduled on the Drawings.
- C. Related Sections include the following:
 - 1. Division 05, METALS, Sections for shop priming of metal substrates. Epoxy based primer for exterior metal.
 - 2. Section 071900, WATER REPELLENTS, for water-repellent treatments applied to exposed exterior CMU.
 - 3. Division 08, OPENINGS, Sections for factory priming hollow metal doors and frames
 - 4. Section 099123, INTERIOR PAINTING, for surface preparation and the application of paint systems on interior substrates.
- D. Scope of Work Under this Section:
 - 1. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural.
 - a. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors.
 - b. If the schedules do not indicate color or finish, the Engineer will select from standard colors and finishes available.
 - c. Where the section specifying the item indicates that the item of work is to be primed and painted at the shop or place of fabrication.
 - 2. Where patching occurs in a painted surface or material, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface, from corner to corner and floor to ceiling, containing the patch.

SECTION 099113 – EXTERIOR PAINTING

3. Painting includes field painting of exposed bare and covered pipes and ducts (including color-coding), hangers, exposed steel and ironwork, and primed metal surfaces of mechanical and electrical equipment.
- E. Surfaces not to be painted:
1. Do not paint prefinished items which include the items listed below:
 - a. Distribution cabinets.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - d. Other items specified to be finished by manufacturer.
 2. Do not paint finished metal surfaces which include the following:
 - a. Anodized or solid color coated aluminum.
 - b. Factory painted metal roof panels.
 - c. Stainless steel.
 - d. Chromium plate.
 - e. Copper.
 - f. Bronze and brass.
 3. Do not paint operating parts which include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 4. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 5. Do not paint structural steel scheduled to receive cementitious fireproofing or to be encased in concrete.

1.02 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

SECTION 099113 – EXTERIOR PAINTING

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials International (ASTM):
 - 1. ASTM D16-07 Standard Terminology for Paint, Related Coatings, Materials, and Applications
- B. Code of Federal Regulations (CFR):
 - 1. 40 CFR, Part 59, Subpart D-2001: National Volatile Organic Compound Emission Standards for Architectural Coatings
- C. Master Painters Institute (MPI):
 - 1. MPI Approved Products List, Current Edition.
 - 2. MPI Architectural Painting Specification Manual, Current Edition
- D. California Air Resources Board Regulations.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For each type of topcoat product indicated.
- D. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.05 QUALITY ASSURANCE

- A. MPI Standards: Preparation and Workmanship: Comply with requirements in “MPI Architectural Painting Specification Manual” for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

SECTION 099113 – EXTERIOR PAINTING

1. Engineer will select one surface to represent surfaces and conditions for application of each paint system specified in PART 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Engineer will designate items or areas required.
2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Engineer at no added cost to City.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.07 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 1. Quantity: Furnish an additional 5 percent, but not less than 1 gallon of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Paint systems scheduled at the end of this section are by Dunne-Edwards and are to be considered base products.

SECTION 099113 – EXTERIOR PAINTING

2. High Performance Coating materials, unless otherwise indicated, shall be manufactured by PPG or equal.
3. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
4. If “No substitutions” is indicated next to the product name, provide only products of listed manufacturers.
5. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
6. The burden of proof of equality of proposed products is on the Contractor.
7. Similar systems by the following manufacturing will be considered for approval subject to match of color, sheen, texture, and performance with materials specified:
 - a. Kelly Moore.
 - b. Sherwin Williams Co.
 - c. Benjamin Moore & Co.
 - d. Or approved equal.

2.02 PAINT, GENERAL

- A. Material Compatibility:
 1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: Paints and coatings to be applied at Project Site shall comply with applicable VOC limits of the South Coast Air Quality Management District Rule 1113: Architectural Coatings, exclusive of colorants added to tint bases, as calculated in accordance with 40 CFR 59 Subpart D (EPA Method 24), as follows:
 1. Flat Coatings: 50 g/L.
 2. Nonflat Coatings: 50 g/L.
 3. Nonflat, High Gloss Coatings (default Nonflat): 50 g/L.
 4. Floor Coatings: 50 g/L.
 5. Industrial Maintenance (IM) Coatings: 100 g/L.
 6. Pre-Treatment Wash Primers: 420 g/L.
 7. Primers, Sealers, and Undercoaters: 100 g/L.
 8. Rust Preventative Coatings: 100 g/L.
 9. Waterproofing Concrete/Masonry Sealers: 100 g/L.
 10. Zinc-Rich IM Primers 100g/L.

SECTION 099113 – EXTERIOR PAINTING

11. All Shop-Primed Metal to be coated in accordance with applicable federal, state, and local regulations.
- C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, and shall comply with the applicable VOC limits of Rule 1113, as follows:
 1. Colorants for Architectural Coatings, excluding IM Coatings: 50 g/L.
 2. Colorants for Solvent borne Industrial Maintenance Coatings: 600 g/L.
 3. Colorants for Waterborne Industrial Maintenance Coatings: 50g/L.
- D. Colors: As selected by Engineer from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Wood: 15 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

SECTION 099113 – EXTERIOR PAINTING

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer. Confirm shop priming is compatible with field paint specification.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove surface oxidation.
- H. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- I. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

SECTION 099113 – EXTERIOR PAINTING

3.04 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: City reserves the right to invoke the following procedure at any time and as often as City deems necessary during the period when paints are being applied:
1. City will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance of paint materials with product requirements.
 3. City may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials.
 4. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.05 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINTING SCHEDULE

- A. Paint Finish Metal (Semi-gloss) - Typical, unless otherwise noted:
1. Prime Coat ENDURAPRIME™ Rust Preventative Acrylic Metal Primer (ENPR00), 100% Acrylic.
 2. Prime Coat. (See Paragraph 3.2.G. of this Specification Section for galvanized metal.)
 3. Second Coat. KM 1250 Acry-Shield 100% Acrylic Semi-Gloss Latex.
 4. Finish Coat. KM 1250 Acry-Shield 100% Acrylic Semi-Gloss Latex.
- B. Paint Finish on Fiber Cement Soffits (Low Sheen):
1. Prime Coat. KM 247 Acry-Shield 100% Acrylic Masonry Primer.

SECTION 099113 – EXTERIOR PAINTING

- 2. Second Coat. KM 1245 Acry-Shield 100% Acrylic Low Sheen Finish.
- 3. Finish Coat. KM 1245 Acry-Shield 100% Acrylic Low Sheen Finish.

C. Sealant at CMU:

- 1. Refer to Specification Section 071900, WATER REPELLENTS.

Ferrous Metal – Gloss	
<i>PPG Protective & Marine Coatings</i>	
Pretreatment	Blast the surface to meet SSPC-SP6 (Commercial Blast)
1st Coat	Dimetcote 21-5/9 Series inorganic Zinc Primer or Amercoat 68HS VOC Organic Zinc Primer @ 3-5 mils DFT
2nd Coat	Amerlock 2VOC @ 6-8 mils DFT
3rd Coat	PSX 700 Siloxane @ 5-7 mils DFT
Non-Ferrous Metal – Gloss	
Pretreatment	Abrasive blast to a SSPC SP 16 guidelines. Surface to have a uniform and dense 1.5-4.0 mil profile.
1st Coat	Amerlock 2VOC @ 6-8 mils DFT
2nd Coat	PSX 700 Siloxane @ 5-7 mils DFT

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Exposed Concrete and CMU.
 - 2. Steel.
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Wood (Paint and Stain)
 - 6. Gypsum board.
 - 7. All exposed duct work and piping.
- C. Related Sections:
 - 1. Section 055000, METAL FABRICATIONS, for shop priming of interior metal substrates.
 - 2. Division 071900, WATER REPELLENTS, for water-repellent treatments applied to exposed interior CMU and Adhered Masonry Veneer surfaces.
 - 3. Division 08, Openings, Sections for factory priming hollow metal doors and frames.
 - 4. Section 099113, EXTERIOR PAINTING, for surface preparation and the application of paint systems on exterior substrates.
- D. Scope of Work Under this Section:
 - 1. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural.
 - a. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors.
 - b. If the schedules do not indicate color or finish, the Engineer will select from standard colors and finishes available.
 - c. Where the section specifying the item indicates that the item of work is to be primed and finish painted at the shop or place of fabrication.
 - 2. Where patching occurs in a painted surface or material, apply primer and intermediate paint coats over the patch and apply final paint coat over entire

SECTION 099123 – INTERIOR PAINTING

unbroken surface, from corner to corner and floor to ceiling, containing the patch.

3. Painting includes field priming and painting of exposed bare and insulated pipes, conduits, ducts, hangers, steel joists, and miscellaneous primed steel fabrications and primed metal surfaces of mechanical and electrical equipment, exposed-to-view except for equipment rooms.

E. Surfaces not to be painted:

1. Do not paint prefinished items which include the items listed below:
 - a. Plastic toilet enclosures.
 - b. Distribution cabinets.
 - c. Finished mechanical and electrical equipment.
 - d. Light fixtures.
 - e. Other items specified to be finished by manufacturer.
2. Do not paint concealed surfaces which include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Utility tunnels.
 - c. Furred areas.
 - d. Ceiling plenums (except in hallways scheduled for wood ceilings).
 - e. Pipe spaces.
 - f. Duct shafts.
3. Do not paint finished metal surfaces which include the following:
 - a. Anodized or solid color coated aluminum.
 - b. Factory painted fascia and copings.
 - c. Stainless steel.
 - d. Chromium plate.
 - e. Copper.
 - f. Bronze and brass.
4. Do not paint operating parts which include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
5. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
6. Do not paint structural steel scheduled to receive cementitious fireproofing or to be encased in concrete.

1.02 DEFINITIONS

- A. General: Standard painting and coating terms as defined in ASTM D16 and ASTM D523 apply to this Section.

SECTION 099123 – INTERIOR PAINTING

- B. Gloss Standards:
 - 1. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell: Low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 - 3. Satin: Low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 4. Semi-Gloss: Medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 5. Full Gloss: High-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.03 REFERENCED STANDARDS

- A. ASTM International:
 - 1. ASTM D16-07: Standard Terminology for Paint, Related Coatings, Materials, and Applications
 - 2. ASTM D523-08: Standard Test Method for Specular Gloss.
- B. Code of Federal Regulations:
 - 1. 40 CFR, Part 59, Subpart D-2001: National Volatile Organic Compound Emission Standards for Architectural Coatings.
- C. Master Painters Institute:
 - 1. MPI Approved Products List, Current Edition
 - 2. MPI Architectural Painting Specification Manual, Current Edition
- D. California Air Resources Board Regulations.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated, including printed statement of VOC content and chemical components.
- C. LEED Submittals:
 - 1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that they meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

SECTION 099123 – INTERIOR PAINTING

- D. Samples for Initial Selection: For each type of top coat product indicated.
- E. Samples for Verification: For each type of paint system and in each color and gloss of top coat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- F. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas.
 - 2. Use same designations indicated on Drawings and in schedules.

1.05 QUALITY ASSURANCE

- A. MPI Standards: Preparation and Workmanship: Comply with requirements in “MPI Architectural Painting Specification Manual” for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Engineer will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Engineer will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Engineer at no added cost to City.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.07 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

SECTION 099123 – INTERIOR PAINTING

- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Paint systems scheduled at the end of this section are by Dunn-Edwards, and are to be considered base products.
 - 2. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 3. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 4. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 5. The burden of proof of equality of proposed products is on the Contractor.
 - 6. Similar systems by the following manufacturing will be considered for approval subject to match of color, sheen, texture, and performance with materials specified:
 - a. Kelly Moore.
 - b. Sherwin Williams Co.
 - c. Benjamin Moore & Co.
 - d. Or approved equal.

2.02 PAINT AND STAIN, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

SECTION 099123 – INTERIOR PAINTING

2. For each coat in a paint system, provide products recommended in writing by manufacturers of top coat for use in paint system and on substrate indicated.
- B. VOC Content: Paints and coatings to be applied at Project Site shall comply with applicable VOC limits of the South Coast Air Quality Management District Rule 1113: Architectural Coatings, exclusive of colorants added to tint bases, as calculated in accordance with 40 CFR 59 Subpart D (EPA Method 24), as follows:
1. Flat Coatings: 50 g/L.
 2. Nonflat Coatings: 50 g/L.
 3. Nonflat – High Gloss Coatings (default Nonflat): 50 g/L.
 4. Floor Coatings: 50 g/L.
 5. Industrial Maintenance (IM) Coatings: 100 g/L.
 6. Pre-Treatment Wash Primers: 420 g/L.
 7. Primers, Sealers, and Undercoaters: 100 g/L.
 8. Rust Preventative Coatings: 100 g/L.
 9. Waterproofing Concrete/Masonry Sealers: 100 g/L.
 10. Zinc-Rich IM Primers 100g/L.
 11. All Shop-Primed Metal to be coated in accordance with applicable federal, state, and local regulations.
- C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, and shall comply with the applicable VOC limits of Rule 1113, as follows:
1. Colorants for Architectural Coatings, excluding IM Coatings: 50 g/L.
 2. Colorants for Solvent borne Industrial Maintenance Coatings: 600 g/L.
 3. Colorants for Waterborne Industrial Maintenance Coatings: 50g/L.
- D. Colors: As selected by Architect from manufacturer's full range. Each room will include one accent color.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Wood: 15 percent.
 3. Gypsum Board: 12 percent.

SECTION 099123 – INTERIOR PAINTING

- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Aluminum Substrates: Remove surface oxidation.
- I. Wood Substrates:
 - 1. Scrape and clean knots and apply coat of knot sealer before applying primer.

SECTION 099123 – INTERIOR PAINTING

2. Sand surfaces that will be exposed to view and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. If undercoats or other conditions show through top coat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
 - a. Uninsulated metal piping; uninsulated plastic piping; pipe hangers and supports.
 - b. Tanks that do not have factory-applied final finishes.
 - c. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - d. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - e. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Electrical Work:
 - a. Switchgear and panelboards.
 - b. Electrical equipment that is indicated to have a factory-primed finish for field painting.

SECTION 099123 – INTERIOR PAINTING

3.04 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: City reserves the right to invoke the following procedure at any time and as often as City deems necessary during the period when paints are being applied:
 - 1. City will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. City may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.05 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR PAINTING SCHEDULE

- A. Paint Finish on Gypsum Wallboard (Flat) – Typical Ceilings, unless otherwise noted:
 - 1. Prime Coat Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Premium VNPR00, MPI #50.
 - 2. Intermediate Coat Premium Architectural Coating, Interior, Water Based matching top coat.
 - 3. Top Coat – Modified copolymer, interior water based, flat, Dunn-Edwards SPARTAZERO, SZRO10, MPI#63 and 143.
- B. Paint Finish on Gypsum Wallboard (Matte) – Typical Walls, unless otherwise noted:

SECTION 099123 – INTERIOR PAINTING

1. Prime Coat Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Premium VNPR00, MPI #50.
 2. Intermediate Coat – Premium Architectural Coating, Interior, Water Based matching top coat.
 3. Top Coat – 100 percent acrylic, interior water based, Matte, Dunn-Edwards, EXQUISITE (EXQT10), MPI#53 and 138Everest.
- C. Paint Finish on Gypsum Wallboard (Semi-Gloss) – Ceilings, Walls, and Trim for Toilet Rooms, Kitchens, Locker Rooms, Medical Clean-up, Laundry, Janitor, and where scheduled:
1. Prime Coat Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Premium VNPR00, MPI #50.
 2. Intermediate Coat – Premium Architectural Coating, Interior, Water Based matching top coat.
 3. Top Coat – 100 percent acrylic, interior water based, eggshell, Dunn-Edwards, EVEREST (EVER50), MPI#54, 141, 147.
- D. Paint Finish on Wood (Semi-gloss) – On wood not scheduled to be stained:
1. Prime Coat – Dunn-Edwards, Inter-Kote Premium, IKPR00-1
 2. Intermediate Coat – Premium Architectural Coating, Interior, Water Based matching top coat.
 3. Top Coat – 100 percent acrylic, interior, water based, semi-gloss, Dunn-Edwards, EVEREST (EVER50), MPI#54, 141, 147.
- E. Paint Finish on Metal (Semi-gloss) – Typical, unless otherwise noted:
1. Prime Coat – Primer on galvanized Metal: water based, Dunn-Edwards, Ultra-Grip Premium UGPR00-1, MPI #17, 134.
 2. Prime Coat – Primer on ferrous and non-ferrous metal: water based, Dunn-Edwards, BLOC-RUST® Premium (BRPR00),
 3. NOTE: Prepare galvanized metal per Paragraph 3.2.G of this Section. Prepare existing metal surfaces per SSPS SP1 and SP2.
 4. Intermediate Coat – Premium Architectural Coating, Interior, Water Based matching top coat.
 5. Top Coat – 100 percent acrylic, interior, water based, semi-gloss, Dunn-Edwards, EVEREST (EVER50), MPI#54, 141, 147.
- F. Paint Finish on Concrete/Concrete Unit Masonry (Semi-Gloss):
1. Block Filler – Block filler, latex, interior/exterior, Dunn-Edwards, Smooth BLOCFIL™ Premium, SBPR00, MPI#4.
 2. Intermediate Coat – Premium Architectural Coating, Interior, Water Based matching top coat.
 3. Top Coat – 100 percent acrylic, interior, water based, semi-gloss, Dunn-Edwards, EVEREST (EVER50), MPI#54, 141, 147.
- G. Paint Finish on Metal Equipment and Exposed Ductwork.
1. Prime Coat – Factory prime coat.

SECTION 099123 – INTERIOR PAINTING

2. Second Coat – Premium Architectural Coating, Interior, Water Based matching top coat.
3. Top Coat – 100 percent acrylic, interior, water based, semi-gloss, Dunn-Edwards, EVEREST (EVER50), MPI#54, 141, 147. (No finish coat on interior of interior ductwork.)

H. Wood Staining

1. Manufacturer: Old Masters.
2. Wood Stain – Old Masters Wiping Stain. (Color to match wood doors.)
3. Wood Finish – Masters Armor® Interior Water-Based Clear Finish (three coats).

END OF SECTION

DIVISION 10
SPECIALTIES

SECTION 101100
VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Glass Markerboards, sizes as indicated on the Drawings.
- C. Related Sections:
 - 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for blocking.
 - 2. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for interior finish carpentry and cabinet work.
 - 3. Section 097723, FABRIC-WRAPPED PANELS, for fabric-wrapped acoustical (AP) and tackable (TB) panels.

1.02 DEFINITIONS

- A. Glass Marker Board: Visual display surface that is glass without a perimeter frame; includes an invisible mounting system.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.
- C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of panel joints.
 - 2. Include sections of typical trim members.

SECTION 101100 – VISUAL DISPLAY SURFACES

- D. Samples: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:
 - 1. Actual sections of Glass Sheets.
 - 2. Include sample installation bracket.
- E. Maintenance Data: For visual display surfaces to include in maintenance manuals.
- F. Warranties: Sample of special warranties.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Engineer. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display surfaces vertically with packing materials between each unit.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

SECTION 101100 – VISUAL DISPLAY SURFACES

1.07 WARRANTY

- A. Special Warranty for Glass Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace glass boards that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit cracking
 - 2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Markerboard Assemblies:
 - 1. Claridge Products & Equipment, Inc., San Leandro, CA, Phone: (510) 351-8183.
 - 2. Or approved equal.

2.02 MARKERBOARD ASSEMBLIES

- A. Frameless Glass Markerboards:
 - 1. 1/4-inch low iron ultra-clear glass.
 - 2. Magnetic and non-glass.
 - 3. Scratch and stain resistant.
 - 4. Four magnets included with each markerboard.
 - 5. Color: Warm White.
- B. MOUNTING STYLE OPTION
 - 1. "Invisi-mount" by Claridge.

SECTION 101100 – VISUAL DISPLAY SURFACES

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display surfaces.
- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

3.03 INSTALLATION, GENERAL

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.04 INSTALLATION OF GLASS MARKERBOARDS

- A. Determine and mark desired height for mounting the magnetic glass Markerboard:
 - 1. Measure down 1-9/16-inch from designated height and strike a horizontal line for the bottom of the Z-bar.
 - 2. Attach Z-bar hanger to wall using appropriate screws. Note: Slotted holes in hanger bar ensure alignment.

SECTION 101100 – VISUAL DISPLAY SURFACES

3. Position board on top of hanger and engage with hanger on back of glass markerboard.
4. Make a mark at bottom corners of glass markerboard and carefully remove board from wall.
5. Measure in and up approximately 2 to 3 inches from marked corners and install dual-lock 'disk' (washer) on wall using appropriate fastener. Press dual-lock strip (tab) firmly into disk on wall making sure mating is secure. Note: Number of dual-lock assemblies furnished varies with markerboard size. 4-foot markerboards get three dual-lock sets; 6-foot size gets four; 8-foot size gets five. (Dual-locks are to be evenly spaced along the bottom of board.)
6. Remove tape from assembly.
7. Reinstall markerboard, engaging hanger on back of markerboard with hanger on wall.
8. Press in at the bottom allowing the back of the glass markerboard to stick to the exposed adhesive on the hook and loop assembly.

3.05 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION

SECTION 101400

SIGNAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Division H – General Requirements, Division I – Technical Requirements: Off-Site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Interior panel-type accessibility signs for building entries and restrooms.
 - 2. Interior panel-type room identification signs.
 - 3. Dedication plaque for Entry Lobby.
 - 4. Dimensional cast aluminum numbers for building address for the Fire Station
 - 5. Dimensional cast aluminum letter for fire station identification signage.
 - 6. Freestanding site post and signs as indicated on the Drawings, including accessibility and EV signs for building and parking.
 - 7. Miscellaneous accessories required for signage installation.
- B. Related Sections:
 - 1. Section 015000, TEMPORARY FACILITIES AND CONTROLS, for temporary Project identification signs and for temporary information and directional signs.
 - 2. Section 033000, CAST-IN-PLACE CONCRETE, for concrete bases for signs and post concrete fill.
 - 3. Division 22, PLUMBING, and Division 23, HEATING, VENTILATING, AND AIR CONDITIONING, Sections "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
 - 4. Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS, for labels, tags, and nameplates for electrical equipment.
 - 5. Section 265600, EXTERIOR LIGHTING, for illuminated exit signs and for remote illumination for monument signs.

SECTION 101400 – SIGNAGE

1.03 REFERENCED STANDARDS

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611-98, Voluntary Specifications for Anodized Architectural Aluminum.
 - 2. AAMA 2603-02, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

- B. American Society for Testing and Materials International (ASTM):
 - 1. ASTM A653-04a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 2. ASTM B26-03, Specification for Aluminum Alloy Sand Casting
 - 3. ASTM B209-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 4. ASTM B221-02, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - 5. ASTM B584-00, Specification for Copper Alloy Sand Castings for General Applications
 - 6. ASTM D4802-02, Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet

- C. American National Standards Institute (ANSI):
 - 1. ANSI A117.1-03, Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People

- D. 2007 California Building Code (CBC):
 - 1. Chapter 11B – Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Publicly Funded Housing: Section 1117B.5 Signs and Identification.

- E. U.S. Architectural and Transportation Barriers Compliance Board
 - 1. Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines. Current Edition.

- F. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual for Architectural and Metal Products. Current Edition.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 016000, SUBMITTAL PROCEDURES.

- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

SECTION 101400 – SIGNAGE

- C. Shop Drawings:
 - 1. Include plans, elevations, and large-scale sections of typical members and other components.
 - 2. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 3. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and Braille layout.
 - 4. Show fabrication and installation details for plaques. Show plaque mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - a. Provide message list, timesteps, graphic elements, and layout for each plaque.
- D. Samples for Initial Selection:
 - 1. For each type of sign and plaque material indicated that involves color selection.
 - 2. For each of the following products and for the full range of color, texture, and plaque material indicated, of sizes indicated:
 - a. Plaque Casting: 6 inches square including border.
 - b. Accessories: Manufacturer's full-size unit.
- E. Samples for Verification: For each type of sign and plaque, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
 - 3. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
 - 4. Approved samples will be returned for installation into Project.
- F. Qualification Data: For Installer.
- G. Maintenance Data: For signage and plaque cleaning and maintenance requirements to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

SECTION 101400 – SIGNAGE

1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction.
2. These include, but are not limited to, the following:
 - a. Illuminated Exit Signs: Refer to Division 26, Electrical.
 - b. Room Capacity.
 - c. Signs for Accessible Spaces.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.07 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Products named or identified by make or model number in other Part 2 articles, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Interior Panel Signs:
 1. Series 200 Dimension Letter Signs as manufactured by Mohawk Sign Systems, Schenectady, New York.
 2. Or approved equal.

SECTION 101400 – SIGNAGE

- C. Dedication Plaques:
 - 1. A.R.K. Ramos, 1321 South Walker, Oklahoma City, OK 73109; Phone: (800) 725-7266; Website: www.arkramos.com.
 - 2. Metallic Arts, 914 North Lake Road, Spokane Valley, WA 99212; Phone: (800) 541-3200; Website: www.metallicarts.com.
 - 3. Or approved equal.

- D. Cast Aluminum Numbers:
 - 1. ASI Sign Systems, Inc.
 - 2. Metal Arts; Div. of L&H Mfg.
 - 3. Mohawk Sign Systems.
 - 4. Gemini Incorporated, Cannon Falls, MN, 800-LETTERS.
 - 5. Or approved equal.

2.02 MATERIALS

- A. Aluminum Castings: ASTM B26, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
- C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.
- D. Bronze Castings: ASTM B584, Alloy UNS No. C86500 (No. 1 manganese bronze).
- E. Steel: Galvanized Steel Sheet: ASTM A653, G90 coating, either commercial or forming steel.
- F. Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.03 INTERIOR PANEL SIGNS (ACCESSIBILITY SIGNS)

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.

SECTION 101400 – SIGNAGE

- B. Graphic Process: Manufacturer's standard process for producing copy complying with CBC Chapter 11B, Section 1117B.5 Signs and Identification, including but not limited to the following:
1. Provide precisely formed characters with square cut edges free from burrs and cut marks.
 2. Tactile letters, symbols, and characters shall be chemically welded, raised the required 1/32 inches from sign face. Glue-on letters or etched backgrounds are not acceptable.
 3. California Contracted Grade 2 Braille, shall accompany all text.
 - a. Dots shall be 1/10-inch (2.54 mm) on center in each cell with 2/10-inch (5.08 mm) space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell.
 - b. Dots shall be raised a minimum of 1/40-inch (0.635 mm) above the background.
 - c. Braille dots shall be domed or rounded.
 - d. Grade 2 Braille translations shall be provided by signage manufacturer.
 4. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background.
 5. Characters and background shall have a non-glare finish
- C. Panel Material:
1. Minimum 1/8-inch-thick, back-painted, non-glare clear acrylic sheet.
 2. Colors: As selected by Engineer.
 3. Shape: 8 inches by 8 inches square, and as indicated on the Drawings.
 4. Corners: Square.
- D. Characters and Symbols:
1. Colors: As selected by Engineer, in contrast with the background.
 2. Raised Letters: 5/8-inch-high, unless otherwise indicated.
 3. Font Type: Sans serif, upper case.
 4. Pictograms: As selected by Engineer in contrast with background.
- E. Locations:
1. Mounting Positions (as indicated on the Drawings): Either on door or on wall adjacent to door, on latch side of door.
 2. Mounting Height: 60 inches above the finish floor to the horizontal centerline of the sign, unless otherwise indicated.
- F. Panel Sign Types:
1. Toilet Room Signs (Accessible Toilet Room Door Symbols):
 - a. Unisex: California Title 24 / A.B. 1732 Unisex Restroom Door Signs
 - b. Room Identification, Miscellaneous Informational and Directional Signs:

SECTION 101400 – SIGNAGE

- c. Provide minimum sizes and text as indicated on Drawings and in accordance with CBC Section 1117B.5.
 - d. Furnish room identification signs in two standard lengths depending upon text.
 - e. Provide one standard length for text up to six characters and one additional length for characters seven or more characters in length.
- G. Mounting Methods:
- 1. 1. Use security-type (removable by special tool), exposed fasteners fabricated from stainless steel.
 - 2. 2. Provide 3 extra tools for maintenance by District personnel.
- H. Anchors and Inserts:
- 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance.
 - 2. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors.
 - 3. Furnish inserts, as required, to be set into concrete or masonry work.

2.04 DIMENSIONAL LETTERS

- A. Cast Aluminum Numbers: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
- 1. Building Address Numbers: “4101;” located as indicated on the Drawings.
 - 2. Font: Century Gothic Narrow.
 - 3. Size and Thickness: 10 inches high, 1/4-inch-thick with 3/4-inch returns.
 - 4. Finish: Bronzed Anodized.
 - 5. Mounting: Concealed studs, non-corroding for substrates encountered.
- B. Cast Aluminum Numbers: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
- 1. Building Identification: “City of Long Beach Fire Station 9”; located as indicated on the Drawings.
 - 2. Font: Century Gothic Narrow.
 - 3. Size and Thickness: 14-inches high, 1/4-inch thick with 3/4-inch returns.
 - 4. Finish: Bronzed Anodized.
 - 5. Mounting: Concealed studs, non-corroding for substrates encountered.

SECTION 101400 – SIGNAGE

2.05 SITE POST AND PANEL SIGNS (ACCESSIBILITY SIGNS)

- A. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 5005-H15.
 - 1. Aluminum Sheet: 0.080-inch thick; with baked enamel finish; colors as selected by Engineer from manufacturer's full range.
 - 2. Lettering, Symbols, and Artwork: Silk-screened with clear protective topcoat, in colors selected by University's Representative.
 - 3. Text/Message, Symbols, and Artwork: As indicated or scheduled on the Drawings.
- B. Aluminum Posts: Manufacturer's standard 0.125-inch-thick, extruded-aluminum tubing, with vertical slots to engage sign panels. Provide stop blocks in slots to hold panels in position. Include post caps, fillers, spacers, and related accessories required for complete installation.
- C. Anchors and Inserts:
 - 1. Use stainless-steel or hot-dip galvanized anchors and inserts.
 - 2. Use torque-controlled expansion-bolt devices for drilled-in-place anchors.
 - 3. Furnish inserts, as required, to be set into concrete.
- D. Concrete for Post Holes: Comply with requirements in Section 033000, CAST-IN-PLACE CONCRETE, for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 2500-psi, unless otherwise indicated.

2.06 PLAQUES

- A. Bronze Castings: ASTM B584, Alloy UNS No. C86500 (220 commercial bronze).
- B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:
 - 1. Plaque Material: Bronze.
 - 2. Background Texture: Stipple texture with black baked enamel finish.
 - 3. Border Style: Single-raised line border with satin finish.
 - 4. Mounting: Rosettes and fasteners matching plaque finish, non-corroding for substrates encountered.
- C. Plaque Schedule:
 - 1. Plaque Size: 24-inches x 36-inches.
 - 2. Character Size: To be determined.
 - 3. Character Finish/Color: Satin bronze.
 - 4. Text/Photograph: As directed by City's Representative.
 - 5. Location: As directed by Engineer.

SECTION 101400 – SIGNAGE

2.07 SIGN AND PLAQUE ACCESSORIES

- A. Mounting Methods: Use security type fasteners fabricated from materials that are not corrosive to sign material and mounting surface.
- B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.08 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples.
 - 1. Noticeable variations in same piece are not acceptable.
 - 2. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.
- C. Cast-Bronze Plaque Finishes: Exposed surfaces free of porosity, burrs, and rough spots; with returns finished with fine-grain air blast.
 - 1. Raised Areas: Hand-tool and buff borders and raised copy to produce manufacturer's standard satin finish.
 - 2. Background Finish: Black color, baked enamel.
 - 3. Clear Protective Coating: Clear-coated and oven-baked with a two-part hardened acrylic polyurethane.
- D. Aluminum Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

SECTION 101400 – SIGNAGE

- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
- B. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- C. Panel Wall Signs:
 - 1. Install signs on walls adjacent to latch side of door where applicable.
 - 2. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
 - 3. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
 - 4. Attach panel signs to surfaces using mechanical fasteners. Use nonremovable mechanical fasteners placed through predrilled holes.
- D. Dimensional Letters and Characters:
 - 1. Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide stainless steel studs.
 - 2. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 3. Projected Mounting: Mount characters at projection distance from wall surface indicated.
- E. Cast-Metal Plaques:
 - 1. Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.
 - 2. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.

SECTION 101400 – SIGNAGE

3.03 INSTALLATION, POST AND PANEL SIGNS

- A. Excavation: In firm, undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for each post to minimum diameter recommended by sign manufacturer, but at least four times the largest post cross-section. Excavate hole depths approximately 39 inches below finished grade.
- B. Setting Posts or Inserts:
 - 1. Center and align posts or inserts in holes 3 inches above bottom of excavation.
 - 2. Protect portion of posts or inserts above ground from concrete splatter. Place concrete and vibrate or tamp for consolidation. Check posts or inserts for alignment and hold in position until concrete has achieved its initial set.
- C. Set anchor bolts and other embedded items required for installation.
 - 1. Use templates furnished by suppliers of items to be attached.
- D. Install signs level, plumb, and at height indicated, with surfaces free from distortion or other defects in appearance.

3.04 CLEANING AND PROTECTION

- A. After installation, clean soiled sign and plaque surfaces according to manufacturer's written instructions. Protect signs and plaques from damage until acceptance by City.

END OF SECTION

SECTION 102600

WALL PROTECTION PANELS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-site Improvements, and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Wall protection panel systems as follows:
 - a. SWP Type 1: Wall covering system of solid vinyl-acrylic of sheet, adhesive installation.
 - b. Corner Guards: Surface Mounted, Stainless Steel corner guards at all exterior corners.
 - 2. Provide panel corner guard colors as scheduled at the end of Part 3 and panel types as indicated on the Drawings.
- C. Related Sections include the following:
 - 1. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for solid-surfacing wall panels for showers.
 - 2. Section 087100, DOOR HARDWARE, for metal armor plates and kick plates.
 - 3. Section 092900, GYPSUM BOARD, for installation of corner guards at wall systems.

1.02 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.
- C. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.
- D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated.

SECTION 102600 – WALL PROTECTION PANELS

1. Include similar Samples of accent strips and accessories involving color selection.
- E. Qualification Data: For Installer.
- F. Material Test Reports: For each impact-resistant plastic material.
- G. Maintenance Data: For each impact-resistant wall-protection unit to include in maintenance manuals.
 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions.
 2. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall-protection units and are based on the specific system indicated. Refer to Section 014000, QUALITY REQUIREMENTS.
 1. Do not modify intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.
- D. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 2. Keep plastic sheet material out of direct sunlight.
 3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

SECTION 102600 – WALL PROTECTION PANELS

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.
- B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Sheet Wall Protection Systems and Corner Guards:
 - 1. Acrovyn® 4000 (PVC-Free) vinyl/acrylic sheet as manufactured by Construction Specialties, Inc., Muncy, PA, Website: <http://www.csgroup.com>.
 - 2. Or approved equal.

2.02 SHEET WALL COVERING PROTECTION PANELS

- A. PVC-Free Plastic Sheet Wall Protection Panels:
 - 1. Acrovyn® 4000 with aluminum top, corner and bottom trim.
 - 2. Matching sealant at vertical butt joints.
 - 3. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D256, Test Method A.
 - 4. Chemical and Stain Resistance: Tested according to ASTM D543.
 - 5. Self-extinguishing when tested according to ASTM D635.
 - 6. Flame-Spread Index: 25 or less.

SECTION 102600 – WALL PROTECTION PANELS

7. Smoke-Developed Index: 450 or less.
8. Thickness: Provide minimum .060-inch-thick panels.

2.03 STAINLESS STEEL CORNER GUARDS

- A. Corner Guards:
 1. Acrovyn® CO Series; 2-inch leg.
 2. 16-gauge type 304 stainless-steel alloy with #4 satin finish.
 3. Mechanically fasten with pre-drilled holes.

2.04 INSTALLATION ACCESSORIES

- A. General: Wall protection panel systems shall be furnished as complete packaged systems.
- B. Aluminum Extrusions and Trim: Alloy and temper recommended by manufacturer for type of use and finish indicated but with not less than strength and durability properties specified in ASTM B221 for Alloy 6063-T5.
 1. Provide profiles as required for complete installation and as indicated on Drawings.
- C. Adhesive: Type recommended by manufacturer for use with material being adhered to substrates indicated.
 1. Use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Gypsum Board and Panel Adhesives: 50 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Contact Adhesive: 80 g/L.

2.05 FABRICATION

- A. Fabricate impact-resistant wall-protection units and corner guards to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

SECTION 102600 – WALL PROTECTION PANELS

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.
 - 1. Examine walls to which impact-resistant wall protection and corner guards will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 2. For impact-resistant wall-protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

- A. General: Install wall-protection panels level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Provide top and edge moldings, corners, and divider bars as required for a complete installation.

3.04 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

SECTION 102600 – WALL PROTECTION PANELS

3.05 SCHEDULE OF COLORS

- A. All Rooms indicate to receive Wall Protection Panels:
 - 1. SWP Type 1 – Sheet wall protection, Finish: Suede.
 - 2. Acrovyn: Final color to be selected by Architect from. Allow for four different colors.

- B. All exterior corners finished with gypsum board are to receive stainless steel corner guards.

END OF SECTION

SECTION 102800
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. The Work of this Section consists of furnishing all transportation, labor, materials, incidentals, and equipment necessary for construction and installation of all toilet and custodial accessories.

1.03 SUBMITTALS

- A. Data to illustrate each accessory at large scale and show installation method including requirement for blocking and backing, by others.
- B. Mirrors: Provide manufacturer's 15-year guarantee against silver spoilage.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Pack accessories individually in a manner to protect accessory and its finish.
- B. Protect adjacent or adjoining finished surfaces and Work from damage during installation of Work of this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturer:
 - 1. Bobrick Washroom Equipment, Inc., or approved equal, as follows:
 - a. Recessed Baby Changing Station: Koala KB-110 SSRE.

SECTION 102800 – TOILET ACCESSORIES

- b. Recessed Toilet Seat Cover Dispenser, Sanitary Disposal and Toilet Tissue Dispenser: B-3092.
- c. Surface Mounted Towel Bar: B-6737.
- d. Recessed Paper Towel Dispenser/Waste Receptacle: B-38034.
- e. Surface Mounted Soap Dispenser: B-2013
- 2. Stainless Steel Framed Mirror:
 - a. Basis-of-Design Product: Bobrick #B-165-2436.
 - b. Mirror: Safety glass.
 - c. Frame: Stainless steel channel with mitered and mechanically interlocked corners.
 - d. Hangers: Rigid, tamper- and theft-resistant installation, using method indicated below:
 - 1) One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - e. Size: 24 inches wide by 36 inches high, unless otherwise shown.
- 3. Grab Bars: Bobrick No. 5806 Series, 1-1/2-inch diameter, length as indicated, stainless steel with concealed mountings.
- 4. Surface Mounted Double Robe Hook: B-76727, two minimum per shower room.
- 5. Accessible Shower Seat: B-517 or 518 (verify orientation).
- 6. Accessible Shower Grab Bar Set: B58616.
- 7. Utility Shelf with Mop/Broom Holders and Rag Hooks:
 - a. Basis-of-Design Product: Bobrick B-239x34.
 - b. Description: Unit with hooks and holders.
 - c. Length: 34 inches.
 - d. Mop/Broom Holders: Spring-loaded, rubber hat, cam type.
 - e. Material and Finish: Stainless steel, No. 4 finish (satin).
- 8. Heavy-Duty Shower Curtain Rod with Concealed Mounting:
 - a. Basis-of-Design Product: Bobrick B-207.
 - b. Heavy Duty Curtain Rod: 18-8, Type-304, 20-gauge stainless steel tubing with satin finish, 1-inch outside diameter.
 - c. Lengths: Provide 72-inch as indicated on the Drawings.
 - d. Flanges: Two 1-3/8-inch diameter. Chrome-plated plastic. Bright polished finish.
 - e. Concealed Mounting Brackets: Two, Aluminum.
- 9. Shower Curtain:
 - a. Basis-of-Design Product: Accessible Construction Inc. Weighted Shower Curtains nylon reinforced anti-bacterial vinyl fabric, flameproof, stain resistant, self-deodorizing, and furnished with aluminum grommets on 6-inch centers, color: White.
 - b. Size: 72 inches high x 72 inches wide.
- 10. Shower Curtain Hooks:
 - a. Basis-of-Design Product: Bobrick, Shower curtain hooks to be 0.09-inch (2 mm) diameter, type-304 stainless steel. Hooks shall be usable

SECTION 102800 – TOILET ACCESSORIES

with 1-inch and 1-1/4-inch (25 and 32 mm) diameter shower curtain rods.

- b. Provide 13 per each specified shower curtain.
11. Accessible Shower Water Dam:
- a. Basis-of-Design Product: Accessible Construction Inc. Collapsible Water Retainer with straight end dams. color: White.
 - b. Length: as indicated on plans.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates and rough-in measurements as required. Verify that all required backing and blocking is provided.
- B. Before starting Work notify City representative in writing of any conflicts detrimental to installation or operation of units.
- C. Verify with City representative exact location of accessories.

3.02 INSTALLATION

- A. Install fixtures, accessories, and items in accordance with manufacturer's printed instructions.
- B. Install true, plumb, and level; securely anchored to substrate.

END OF SECTION

SECTION 102820

GLASS SHOWER DOORS AND PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SECTION INCLUDES

- A. Glass shower doors, side panels, and hardware.

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1, Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C1048, Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300, SUBMITTAL PROCEDURES.
- B. Shop Drawings: Indicate shower door and side panel plans, elevation views, dimensions, details of supports, door swings.
- C. Product Data: Provide data on glass, hardware, and accessories.

1.05 REGULATORY REQUIREMENTS

- A. Comply with Code of Federal Regulations, Title 16, Chapter II, Part 1201 – Safety Standard for Architectural Glazing Materials.

SECTION 102820 – GLASS SHOWER DOORS AND PANELS

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The basis of design for shower enclosure systems is American Shower Door, Inc., as a standard of quality and appearance. Substitutions will be considered under the provisions of Section 016000, PRODUCT REQUIREMENTS.

2.02 MATERIALS

- A. Glass: Safety Glass. ASTM C1048, Kind FT fully tempered, Condition A uncoated, Type 1 transparent flat, Obscure, Quality q3 glazing select, 1/2-inch-thick.
- B. Hardware and Fittings:
 - 1. Door: 8000 Series, Hinged, Panels with leak proof jambs.
 - a. Hardware: Aluminum, Satin Nickel Finish.
 - b. Swing: 90-degree in and out.
 - c. Closing Type: Self-centering when within 15 degrees of closed position.
 - 2. Pull Handles: "D" loop, 8-inch back-to-back with metal washers.
 - a. Material: 3/4-inch diameter brass rod.
 - b. Finish: Satin Nickel
 - 3. Side Panels: Curtain Wall #6
 - a. Material: Aluminum, Satin Nickel Finish.
- C. Door and Side Panel Layout – As indicated on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions under provisions of Section 017300, EXECUTION.

3.02 INSTALLATION

- A. General:
 - 1. Install doors and sidelights secure, rigid, plumb, and level in accordance with manufacturer's instructions.

SECTION 102820 – GLASS SHOWER DOORS AND PANELS

2. Maintain 3/8-inch to 1/2-inch space between wall and panels.
3. Install system to the inside of the precast edge to limit water running to floor.
4. Attach hinges and channel frames securely to walls using anchor devices.

3.03 ERECTION TOLERANCES

- A. Maximum Variation From True Position: 1/4-inch.
- B. Maximum Variation From Plumb: 1/8-inch.

3.04 ADJUSTING AND CLEANING

- A. Adjust work under provisions of Section 017300, EXECUTION.
- B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16-inch.
- C. Adjust adjacent components for consistency of line or plane.
- D. Clean exposed surfaces of partitions, hardware, fittings, and accessories.

END OF SECTION

SECTION 104413

FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Fire protection cabinets for portable fire extinguishers.
- C. Related Sections:
 - 1. Division 09, Finishes, Sections for field painting fire protection cabinets.
 - 2. Section 104416, FIRE EXTINGUISHERS, for portable fire extinguishers place in cabinets.

1.02 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A666-00, Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 2. ASTM A1008-00, Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 3. ASTM B36-95, Specification for Brass Plate, Sheet, Strip, and Rolled Bar.
 - 4. ASTM C1048, Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
 - 5. ASTM E814-06, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 10 Current Edition, Portable Fire Extinguishers.

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.

SECTION 104413 – FIRE EXTINGUISHER CABINETS

- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size as follows: 6 by 6 inches square
- E. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.04 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described in other Part 2 articles are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor:

SECTION 104413 – FIRE EXTINGUISHER CABINETS

- B. Fire Extinguisher Cabinets:
 - 1. Architectural Series Model #2409 as manufactured by Larsen's, Telephone: (800) 527-7367; Website: www.larsensmfg.com.
 - a. Door Style: Contemporary V with view panel.
 - b. Types: provide recessed and semi-recessed in sizes as required for each type of portable fire extinguisher and wall conditions as indicated on the Drawings.
 - 2. Or approved equal.

2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B.
- B. Tempered Float Glass:
 - 1. ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.03 FIRE-PROTECTION CABINETS

- A. Cabinet Construction:
 - 1. Cabinet Material: Enameled-steel sheet with factory finish.
 - 2. Cabinet box semi-recessed in walls of sufficient depth to suit wall.
 - 3. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend) of 1/4- to 5/16-inch.
 - 4. Cabinet Trim Material: Same material and finish as door.
 - 5. Door Material: Enameled-Steel sheet with factory finish.
- B. Door Hardware:
 - 1. Lock: "SAF-T-LOK," a steel cam lock-based designed to permit opening of the cabinet door by pulling sharply on the handle during an emergency. Keyed for service access. Provide keying as directed by City.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
 - 3. Provide lettering applied to door as follows: "FIRE EXTINGUISHER" and "IN CASE OF FIRE ONLY – PULL FIRMLY ON HANDLE". Lettering shall comply with authorities having jurisdiction for letter style, color, size, spacing and location.
 - a. Application Process: Silk screened.
 - 4. Cabinet hardware shall be easy to grasp with one hand, and shall not require tight grasping, pinching, or twisting of the wrist to operate. Maximum effort to operate doors shall not exceed 5-lbs. per CBC 1125B.4 and CBC 1117B6.4.
- C. Finishes: Manufacturer's standard baked-enamel paint for the following:
 - 1. Exterior of cabinet door, and trim; Color: Red.

SECTION 104413 – FIRE EXTINGUISHER CABINETS

2. Interior of cabinet and door; Color: White.

2.04 FABRICATION

- A. Fire-Protection Cabinets:
 1. Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 2. Weld joints and grind smooth.
 3. Provide factory-drilled mounting holes.
- B. Cabinet Doors:
 1. Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 2. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2-inch-thick. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.05 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping. Finish fire-protection cabinets after assembly.
- C. Appearance of Finished Work:
 1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples.
 2. Noticeable variations in the same piece are not acceptable.
 3. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

SECTION 104413 – FIRE EXTINGUISHER CABINETS

- B. Baked-Enamel Finish:
 - 1. Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat.
 - 2. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.02 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Extinguisher Cabinets: Mount cabinets at height that locates fire extinguisher handle at maximum 48 inches above finish floor.
 - 2. Mounting Brackets: Mount brackets at height that locates fire extinguisher handle at maximum 48 inches above finish floor.
- B. Fire-Protection Cabinets:
 - 1. Fasten fire-protection cabinets to structure, square and plumb.
 - 2. Unless otherwise indicated, provide fire-rated fire-protection cabinets at fire-rated wall construction and non-fire rated elsewhere.
 - 3. Provide inside latch and lock for break-glass panels.
 - 4. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.03 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

SECTION 104413 – FIRE EXTINGUISHER CABINETS

- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 104416
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section includes:
 - 1. Portable, hand-carried fire extinguishers installed in fire extinguisher cabinets where shown and with mounting brackets for fire extinguishers shown to be wall hung.
- B. Related Sections:
 - 1. Section 10413, FIRE EXTINGUISHER CABINETS.

1.03 REFERENCED STANDARDS

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 10-98: Portable Fire Extinguishers.

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

SECTION 104416 – FIRE EXTINGUISHERS

1.05 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Portable Fire Extinguishers.”
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.06 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described in other Part 2 articles are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor:

SECTION 104416 – FIRE EXTINGUISHERS

- B. Fire Extinguishers:
 - 1. Badger Fire Protection, Telephone: (800) 446-3857, Website: www.badgerfire.com.
 - 2. Or approved equal.

2.02 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Valves: Manufacturer's standard.
 - 2. Handles and Levers: Manufacturer's standard.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type ABC in enameled steel containers as follows:
 - 1. Badger #B5M-1, UL Rating of 2A-10B:C, 5-lb nominal capacity; dimensions: 15.25 inches high x 7.5 inches wide x 4.25 inches deep.
 - 2. Provide typical unless otherwise noted.

2.03 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Engineer.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

SECTION 104416 – FIRE EXTINGUISHERS

3.02 INSTALLATION

- A. General: Install fire extinguishers in fire extinguisher cabinets or with mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations where fire extinguisher cabinets are not indicated.
 - 1. Mount brackets at height that locates fire extinguisher handle at maximum 44 inches above finish floor.

END OF SECTION

SECTION 105143

WIRE MESH STORAGE LOCKERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Wall mounted wire mesh storage lockers for Firefighter turnout gear.
- C. Related Sections:
 - 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for blocking for locker attachment.
 - 2. Section 092900, GYPSUM BOARD, for wall finishes coordination.
 - 3. Section 102600, WALL PROTECTION PANELS, for wall protection coordination.
 - 4. Division 26, Electrical, Sections for electrical service to each locker unit.

1.02 SUBMITTALS

- A. General: Submit in conformance with General Requirements, Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated.
- C. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wire mesh items.
- D. Welding certificates.
- E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- F. Include clearances required for operation of doors.
- G. Samples for Initial Selection: 12-inch by 12-inch panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.

SECTION 105143 – WIRE MESH STORAGE LOCKERS

- H. Qualification Data: For qualified Installer.
- I. Maintenance Data: For wire mesh unit hardware to include in maintenance manuals.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Installer's responsibilities include fabricating and installing wire mesh items and providing professional engineering services needed to assume engineering responsibility.
- C. Source Limitations: Obtain wire mesh items from single source from single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire mesh items with cardboard protectors on perimeters of panels and doors and with posts wrapped and crated to provide protection during transit and Project site storage. Use vented plastic.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers:
 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 01 60 00, Product Requirements, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.

SECTION 105143 – WIRE MESH STORAGE LOCKERS

- B. Turnout Gear Lockers:
 - 1. GEARGRID Product Line as manufactured by Mid-Minnesota Wire, Forest Lake, MN, Telephone: (888) 643-6694, Website: www.geargrid.com.
- C. Or approved equal.

2.02 MATERIALS

- A. Steel Wire: ASTM A510.
- B. Steel Plates, Channels, Angles, and Bars: ASTM A36.
- C. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B.
- D. Steel Pipe: ASTM A53, Schedule 40 unless another weight is indicated or required by structural loads.
- E. Steel Tubing: ASTM A513, cold-formed structural-steel tubing.
- F. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.

2.03 WALL-MOUNTED WIRE MESH STORAGE SYSTEMS

- A. Turnout Gear Lockers:
- B. Types: Wall-Mounted as indicated on the Drawings.
- C. Locker Size: "Standard" with nominal dimensions: 74-1/2 inches high x 20 inches wide x 20 inches deep.
- D. Construction:
 - 1. Units shall be welded at all applicable joints.
 - 2. Forming of metal shall be completed by standard cold-forming operations.
 - 3. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.
- E. Vertical Dividers:
 - 1. Outer Frames: 1.25-inch o.d. x 16-gauge wall thickness ASTM A513 steel tubing.
 - 2. Inner Grid: 0.25-inch diameter, ASTM A510 cold drawn steel wire resistance welded to a 3-inch square pattern.
 - 3. Back Panel Grid: 0.25-inch diameter, ASTM A510 cold drawn steel wire resistance welded to a 3-inch square pattern.
- F. Shelves: One Top and one Bottom.

SECTION 105143 – WIRE MESH STORAGE LOCKERS

- G. Construction: 0.25-inch diameter, ASTM A510 cold drawn steel wire resistance welded and cold formed.
- H. Top shelf includes a 20-gauge steel bracket to accept a 2-inch x 16-inch name placard.
- I. Name Plates:
 - 1. Frame: 20 GA sheet metal.
 - 2. Name Plate: Provide one 2-inch x 16-inch custom printed name plate per locker. City to provide names for fabrication
- J. Apparel Hooks: Three per opening of 0.25-inch diameter, ASTM A510 cold drawn steel wire resistance welded and cold formed.
- K. Horizontal Hanging Bars:
 - 1. Tube: 1.25-inch o.d. x 16-gauge 304 stainless steel tubing.
 - 2. Brackets: Attach to side mesh, powder coated.
- L. Coat Drying Hanger one per locker:
 - 1. 0.25-inch diameter 304 stainless steel wire cold-formed and resistance welded.
 - 2. Black vinyl coating on hook end.
- M. Glove Drying Hanger one per locker:
 - 1. 0.25-inch diameter 304 stainless steel wire cold-formed and resistance welded.
 - 2. Black vinyl coating on hook end.

2.04 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated.
- B. Use larger-sized components as recommended by wire mesh item manufacturer.
- C. As required for complete installation, provide bolts, hardware, and accessories with manufacturer's standard finishes.
- D. Fabricate wire mesh items to be readily disassembled.
- E. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.

2.05 FINISHING

- A. General: All system components excluding assembly and mounting hardware and stainless steel components are to receive the standard finish.

SECTION 105143 – WIRE MESH STORAGE LOCKERS

- B. Finish: Components to be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable TGIC powder coating.
- C. Color: Red.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install wire mesh lockers and miscellaneous storage accessories in accordance with manufacturer's instructions. Use manufacturer's hardware for assembly.
- B. Anchor to mounting surface with proper hardware. Anchor wire mesh storage lockers to walls at minimum 12 inches o.c. through back corner panel framing.
- C. For metal stud partitions, use hanger or screws set into continuous metal channel between studs at top and bottom of locker. Coordinate with framing work to locate backing members.

3.03 CLEANING AND TOUCHUP

- A. Remove and replace defective work including wire mesh panels and framing that are warped, bowed, or otherwise unacceptable.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION

SECTION 105613
METAL STORAGE SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Wire open storage systems units designated in configurations and locations as indicated on the Drawings. Storage systems are unassembled and require field assembly.
 - 2. Provide CBC compliant seismic bracing and anchor all open storage systems units to floor and solid blocking or backing within adjacent steel stud framed walls as applicable.
- C. Related Sections:
 - 1. Section 051200, STRUCTURAL METAL AND MISCELLANEOUS IRON, blocking for anchoring storage systems at metal framed partitions.
 - 2. Section 092900, GYPSUM BOARD, for coordination of wall finishes.
 - 3. Section 102600, WALL PROTECTION PANELS, for coordination of wall protection systems.
 - 4. Section 105143, WIRE MESH STORAGE LOCKERS, for wire mesh Fire Fighter locker.

1.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance:
 - 1. Provide metal storage systems capable of withstanding the effects of earthquake motions determined according to ASCE 7, “Minimum Design Loads for Buildings and Other Structures:” Section 9, “Earthquake Loads.”

1.03 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.

SECTION 105613 – METAL STORAGE SYSTEMS

- B. Product Data:
 - 1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage systems.
 - 2. Product Test Reports: Include structural analysis data for systems units, including capacities of systems sections, compression members, and shelf connectors; signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Shop Drawings:
 - 1. Show fabrication and installation details for metal storage systems, including upright-to-shelf/arm connections, lateral bracing, and attachments to other work.
 - 2. Include plans, elevations, sections, details, and relationship to other work.
- D. Samples for Initial Selection:
 - 1. For units with factory-applied color finishes.
 - 2. Include similar Samples of accessories involving color selection.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For metal storage systems to include in maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain metal storage systems through one source from a single manufacturer.
- C. Product Options:
 - 1. Drawings indicate size, profiles, and dimensional requirements of metal storage systems and are based on the specific system indicated.
 - 2. Do not modify intended structural performance and aesthetic effects, as judged solely by Engineer, except with Engineer's approval.
 - 3. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal storage systems palleted, wrapped, or crated to provide protection during transit and Project-site storage.

SECTION 105613 – METAL STORAGE SYSTEMS

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage systems until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

1.07 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage systems attached to wall assemblies.
- B. Coordinate locations and installation of metal storage systems that may interfere with ceiling systems including lighting, HVAC, and sprinklers.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 1 shelf.
 - 2. Shelf Labels: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 labels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.

SECTION 105613 – METAL STORAGE SYSTEMS

- B. Wire Mesh Open Storage Systems:
1. Metro Super Erecta Shelf® Stainless Steel Wire Systems System as manufactured by InterMetro Industries Corp., Wilkes-Barre, PA, Telephone: 800-433-2232, Website: www.metro.com; or approved equal.
 - a. Provide all components and accessories for complete installations as required for configurations shown including the following features:
 - b. Stationary systems units have max. load capacity (evenly distributed) of 2,000 lbs.
 - c. Shelves and Post Construction: Heavy-gauge Type 304 stainless steel.
 - d. Wire Systems: Adjustable, open wire design. 14 inches deep, five high.
 - e. Shelves can be adjusted at 1-inch intervals along the entire length of post.
 - f. Shelf ribs run front to back.
 - g. Posts: SiteSelect™ Posts with a double groove visual guide feature every 8 inches, circular grooves at 1-inch increments, and numbered at 2-inch intervals.
 - h. Tapered split sleeve snaps together around each post.
 - i. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock, without the use of any special tools.
 - j. Stationary posts are equipped with stainless steel leveling feet.
 - k. Provide the following systems unit sizes, in configurations indicated on the Drawings.
 - l. Foot Plate - Bolt units to the flooring using manufacturer provided foot plates:
 - 1) Stainless Steel Cat. No. 9993S.

2.02 FINISHES

- A. Stainless-Steel Finishes:
1. Remove tool and die marks and stretch lines or blend into finish.
 2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 3. Bright, Directional Satin Finish: No. 4.
 4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

SECTION 105613 – METAL STORAGE SYSTEMS

- B. Examine floors for suitable conditions where storage systems will be installed.
- C. Examine walls to which storage systems will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Vacuum finished floor and wet mop floor over which storage systems is to be installed.

3.03 INSTALLATION

- A. Install metal storage systems level, plumb, square, rigid, and true, and within erection tolerances specified.
- B. Anchor systems units to floor with post-installed expansion anchors or power-actuated fasteners through foot plate.
 - 1. Shim foot plate as required to achieve level and plumb installation.
 - 2. Install ribbed metal deck systems spanning from front to back of systems units.
 - 3. Install seismic supports and bracing as recommended by manufacturer and authorities having jurisdiction, and as required for stability. Extend and fasten members to supporting structure.
 - 4. Install shelves in each systems unit at spacing indicated on Drawings or, if not indicated, at equal spacing.
- C. Erection Tolerances: Erect storage systems with a maximum tolerance from vertical of 1/4-inch from 0 to 10 feet of height.

3.04 ADJUSTING AND CLEANING

- A. On completion of installation, clean exposed surfaces as recommended by manufacturer.
- B. Touch up marred finishes or replace metal storage systems that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage systems manufacturer.
- C. Replace storage systems that have been damaged or have deteriorated beyond successful repair.

END OF SECTION

SECTION 107500

FLAGPOLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. One vertical ground- mounted aluminum flagpole, 50 feet high, exposed Height.
 - 2. United States Flag:
- C. Related Sections:
 - 1. Division 03, Concrete, for foundation system.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
 - 1. Provide flagpoles capable of withstanding the effects of wind loads as determined according to the building code in effect for this Project or NAAMM FP 1001, “Guide Specifications for Design Loads of Metal Flagpoles,” whichever is more stringent.
 - 2. Base flagpole design on maximum two standard-size flags suitable for use with pole size indicated.

1.03 REFERENCED STANDARDS

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611-98, Voluntary Specification for Anodized Architectural Aluminum.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A123-02, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM B241-02, Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
 - 3. ASTM D1187-02, Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

SECTION 107500 – FLAGPOLES

1.04 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Delegated-Design Submittal:
 - 1. Show compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Include loads, point reactions, and locations for design of flagpole foundation system.
- C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- D. Shop Drawings: For flagpoles.
 - 1. Include plans, elevations, details, and attachments to other work.
 - 2. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Qualification Data: For qualified professional engineer.
- G. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of flagpole as complete unit, including fittings, bases, and anchorage devices, from single source from single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral-wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

SECTION 107500 – FLAGPOLES

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Flagpole:
1. Standard ground set cone tapered aluminum flagpole with cam cleat concealed halyard as provided by L. Ph. Bolander & Sons. 1355 Evans Ave. San Francisco, CA 94124, Telephone: (800) 434-5611, or approved equal.
 2. 50-foot exposed height gold anodize spun aluminum ball, stationary non-foul truck detail, bronze swivel snaps with white vinyl cover, polyester halyard, locking access door with keyed cylinder lock, bronzed aluminum color.
 3. Foundation system design and calculations to be provided by Contractor.

2.02 FLAGPOLES

- A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
1. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 3. Provide self-aligning, snug-fitting joints.
- B. Exposed Height: 50 feet.
- C. Standard Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241, Alloy 6063, with a minimum wall thickness of 0.188-inch.
- D. Ground Set: Concrete foundation as designed by Contractor.

SECTION 107500 – FLAGPOLES

2.03 FITTINGS AND ACCESSORIES

- A. Internal Halyard, Winch System:
 - 1. Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
 - 2. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard with neoprene or vinyl covers.

2.04 MISCELLANEOUS MATERIALS

- A. Sand: ASTM C33, fine aggregate.
- B. Elastomeric Joint Sealant: Single-component neutral- and basic-curing silicone joint sealant complying with requirements in Section 079200, JOINT SEALANTS.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.05 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 ALUMINUM FINISHES

- A. Bronzed Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.

SECTION 107500 – FLAGPOLES

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FLAGPOLE INSTALLATION

- A. General: Install flagpoles and lighting where shown in accordance with approved shop drawings and manufacturer's written instructions.
- B. Foundation System: Anchor pole base securely in concrete foundation with base plates and ground spike as indicated on Shop Drawings.

END OF SECTION

DIVISION 11
EQUIPMENT

SECTION 113100

APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Cleaning appliances at fire station:
 - a. Dishwasher.
 - b. Clothes washer.
 - c. Clothes dryer.
 - d. Turn-out washer.
 - e. Turn-out dryer
 - 2. Cooking equipment including:
 - a. Gas range.
 - b. Microwave oven.
 - c. Coffee makers.
 - d. Ventilation range hoods.
 - 3. Refrigerator/freezers.
 - 4. Ice machines.
- C. Related Sections Include the Following:
 - 1. Section 055000, METAL FABRICATIONS, for steel equipment supports.
 - 2. Section 064023, INTERIOR ARCHITECTURAL CASEWORK AND COUNTERTOPS, for custom-made cabinets and countertops that receive residential appliances.
 - 3. Divisions 22, PLUMBING, and Division 23, HEATING, VENTILATING, AND AIR CONDITIONING, Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; valves, pipes, and fittings; for water distribution piping, drainage and vent piping connections to residential appliances, and for kitchen sinks, garbage/waste disposers, and water treatment systems and other materials required to complete installation.
 - 4. Division 26, ELECTRICAL, Sections for wiring disconnect switches, and other electrical materials required to complete commercial laundry equipment installation.
 - 5. Section 335100, GAS DISTRIBUTION, gas pipe connections to residential appliances.

SECTION 113100 – APPLIANCES

1.2 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.
- C. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for each product.
- E. Research/Evaluation Reports: For each product.
- F. Maintenance Data: For each product to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain residential appliances through one source from a single manufacturer.
 - 1. Provide products from same manufacturer for each type of appliance required.
 - 2. To the greatest extent possible, provide appliances by a single manufacturer for entire Project.
- C. Regulatory Requirements: Comply with provisions of the following product certifications:
 - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
 - 3. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.
 - 4. NAECA: Provide residential appliances that comply with NAECA standards.
- D. Regulatory Requirements, Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S.

SECTION 113100 – APPLIANCES

Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Operable Parts: Provide controls with forward reach no higher than 48 inches above the floor, horizontal front reach no more than 25 inches, horizontal side reach no more than 24 inches, and that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5-lbf.
 2. Range or Cooktop: Provide knee clearance for forward approach of 27 inches high, 30 inches wide, and 11 inches horizontally; toe space clearance of 9 inches high and 17 inches horizontally; with insulated underside of cooktop to prevent burns, shocks, or abrasions. Provide top surface 34 inches above the floor, with controls that do not require reaching across burners.
 3. Refrigerator/Freezer: Provide 50 percent of freezer space within 54 inches of the floor.
- E. AHAM Standards: Provide appliances that comply with the following AHAM standards:
1. Dishwashers: AHAM DW-DW1.
 2. Clothes Dryers: AHAM HLD-1.
 3. Household Refrigerators: AHAM HRF-1.
 4. Household Freezers: AHAM HRF-1.
- F. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.

1.4 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
1. Microwave Oven: 5-year limited warranty for in-place service on defects in the magnetron tube.
 2. Refrigerator/Freezer: 5-year limited warranty for in-place service on the sealed refrigeration system.
 3. Dishwasher: 10-year warranty for in-place service against deterioration of tub and door liner.
 4. Clothes Washer: 10-year limited warranty for in-home service on the inner wash basket and outer tub, and 5-year limited warranty for in-home service on the balance suspension system and drive transmission.

SECTION 113100 – APPLIANCES

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Basis-of-Design Product: The design for each residential appliance is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 APPLIANCES

- A. Stainless Steel Gas Range/Electric Oven at Fire Station Kitchen:
1. Wolf 60-inch Dual Fuel Model # DF60650CG/S/P.
 2. Standard Features:
 - a. Classic stainless steel exterior finish with island trim included.
 - b. Red control knobs.
 - c. LED Backlit control knobs and Platinum bezels surround all knobs – chrome or brass bezels optional
 - d. Dual-stacked, sealed burners, all with simmer capabilities and automatic re-ignition at all settings.
 - e. Melt feature on 9,200 Btu/hr burner.
 - f. Dual Convection Ovens with Ten cooking modes, temperature probe and self-clean features. One broiler pan per oven.
 - g. Porcelain-coated cast iron continuous top grates.
 - h. Pivoting hidden touch control panel.
 - i. Coaxial temperature displaying oven selector knobs.
 - j. Cobalt blue porcelain oven interiors with LED lighting.
 - k. One standard and two adjustable oven racks with full extension per oven.
 - l. Hidden bake element and recessed broil element in each oven.
 - m. Spring/damper door hinge system.
 3. Cooktop Surface Features:
 - a. 1 – 9,200 Btu burner
 - b. 2 – 15,000 Btu burners
 - c. 2 – 18,000 Btu burners
 - d. 1 – 20,000 Btu burner
 - e. 1 – 30,000 Btu Double Adjustable Infrared Griddle
 - f. Stainless-steel griddle cover

SECTION 113100 – APPLIANCES

- g. Stainless-steel island trim riser included
- B. Dishwasher at Fire Station Kitchen
 - 1. Bosch Stainless Steel under Counter Dishwasher or approved equal:
 - a. Model # 24" Pocket Handle Dishwasher 800 Series – Stainless Steel SHP78CP5N.
 - b. Energy Star Certified.
- C. Stainless Steel Ventilation Range Hood at Fire Station Kitchen:
 - 1. Wolf Pro 27-inch Deep Wall Ventilation Hood, MODEL #PW602718.
 - 2. Specifications:
 - a. Overall Width of Hood: 60 inches.
 - b. Overall Height of Hood: 18 inches plus vertical stainless duct cover height as shown on drawings.
 - c. Overall Depth of Hood: 27 inches (including rail).
 - d. Internal Blower: 1200 CFM.
 - e. Discharge: Vertical.
 - f. Duct Size: 10 inches round.
 - g. Electrical Supply Requirements: 110/120 V AC, 60 Hz 15-amp dedicated circuit.
- D. Refrigerator/Freezers at Fire Station Kitchen:
 - 1. Bosch, 500 Series – Stainless Steel Refrigerator
 - 2. Model # B36CT81ENS
 - 3. Specifications:
 - a. Dimensions: 35 5/8" inches W x 72 inches H x 28 inches D.
 - b. Refrigerator Capacity: 14.8.0 cf.
 - c. Freezer Capacity: 6.0 cf.
 - d. Electrical Supply: 115 VAC, 60 Hz.
 - e. Electrical Service: 15-amp dedicated service.
 - f. Plumbing Supply: 1/4-inch o.d. copper.
 - g. Plumbing Pressure: 35-120 psi.
 - 4. Accessories:
 - a. UltraClarityPro™ Water Filter: BORPLFTR55.
 - b. Ethylene Filter Kit: FPETHKT50.
 - c. Ethylene Filter Refill Kit: FPETHRF50.
 - d. 90 Degree Door Stopper: 10012733.
 - 5. Energy Star Certified.
- E. Microwave:
 - 1. Bosch 800 Series HMB50152UC
 - 2. 30inch microwave drawer with 1.6 cubic feet capacity, 950-watt power, open-close touch control, glass touch controls, automatic sensor programs, interior light, timer and child lock.
 - 3. Stainless steel with built-in trim kit.
 - 4. Coordinate with cabinet subcontractor and electrical subcontractor.

SECTION 113100 – APPLIANCES

- F. Coffee Maker at Fire Station Kitchen:
1. Axiom Dual-Voltage Thermal Carafe Coffee Brewer # AXIOM-DV-TC as manufactured by Bunn-O-Matic® Corp., Springfield, IL, Telephone: (800) 637-8606; Website: www.bunn.com.
 - a. Dimensions: 17.9 inches H x 9 inches W x 18.5 inches D.
 - b. Provide the following accessories:
 - 1) Two Thermal Carafes (one black, one Orange).
 - 2) One case of Paper Filter Packs.
 - 3) Three Easy Clear® EQ-17-TL Filter Units.
 2. Electrical (verify and coordinate electrical requirements):
 - a. 120V requires two wires plus ground service rated 120V, single phase, 60 Hz.
 - b. 20/208V or 120/240V requires three wires plus ground service rated 120/208V or 120/240V, single phase, 60 Hz.
 3. Plumbing:
 - a. 20-90 psi, supplied with 1/4-inch male flare fitting.
 - b. Brew Rate: 4.2 to 7.5 gallons per hour.
- G. Ice Machine at Medical Supply Storage:
1. Scotsman Ice Systems Scotsman – Scotsman: UF2024MA-1; Air Condensing Unit
 2. Ice production/24 hours: 230 lb (104 kg) per day.
 3. Storage Capacity: 80 lbs storage capacity.
 - a. Includes 6-foot cord and plug 115/60/1.
 - b. Provide 3-year parts and labor/5-year compressor warranty.
 - c. Dimensions: 24 inches W x 28.5 inches D x 39 inches H.
 4. Energy Star Certified

2.3 LAUNDRY EQUIPMENT

- A. Manufacture: Speed Queen by Alliance Laundry Systems or approved equal.
1. Washing Machine (Laundry): Speed Queen Front Load Washer; Model DR7, Number FF7009WN. Confirm door hand. Color shall be White. Energy Star and ADA Compliant. Provide 5-year warrantee.
 2. Dryer (Laundry): Speed Queen Gas Dryer, Model DR7, Model Number DR7004WG. Color shall be White. Energy Star and ADA Compliant. Provide 5-year warrantee.
- B. Turn-out Gear Washer:
1. Manufacturer: UniMac or approved equal.
 2. UC Series, Cabinet, Hardmount, Washer/extractor
 3. Model No. UCT040QN.
 4. Controls: M9.
 5. Capacity: 40 lbs.
- C. Turn-out Gear Dryer

SECTION 113100 – APPLIANCES

1. Manufacturer: UniMac or approved equal.
2. Firefighter PPE Drying Cabinet.
3. Model No. UTGC6EDG44.
4. Capacity: Six full sets of Turnouts.
5. Power Requirements: 208v, 3-Phase.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Stainless-Steel Finish: Provide appliances with manufacturer's standard finish complying with manufacturer's written instructions for surface preparation including ground and polished stainless-steel surfaces for uniform, directionally textured finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

SECTION 113100 – APPLIANCES

- D. Utilities: Refer to Division 22, PLUMBING, and Division 26, ELECTRICAL, for plumbing and electrical requirements.

3.3 CLEANING AND PROTECTION

- A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train District maintenance personnel to adjust, operate, and maintain residential appliances. Refer to Section 017700, CLOSEOUT PROCEDURES.

END OF SECTION

SECTION 115200
AUDIO-VISUAL EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Recessed mounting brackets for flat screen LCD televisions, as indicated on the Drawings and as scheduled in Part 2.
 - 2. Installation of Owner Provided TV's, Monitors and Smart Boards.
- C. Related Sections:
 - 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, for framing and blocking for mounting brackets.
 - 2. Section 055000, METAL FABRICATIONS, for metal fasteners and supports.
 - 3. Division 26, Electrical, Sections for electrical service and connections including device boxes for switches and conduit, where required, for low-voltage control wiring.

1.02 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit for each type of product indicated.
 - 1. Submit manufacturer's product illustrations, data, and literature.
- C. Shop Drawings: Show fabrication and installation details for mounting brackets.
 - 1. Show mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Wiring Diagrams: Power, signal, and control wiring.

SECTION 115200 – AUDIO-VISUAL EQUIPMENT

1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install LCD televisions until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.05 COORDINATION

- A. Coordinate layout and installation of LCD televisions and brackets with adjacent construction

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described in other Part 2 articles below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Flat Screen LCD-TV Mounting Brackets:
 - 1. LCD TV mounting brackets shall be as manufactured by Chief Manufacturing, website: www.chiefmfg.com; available through USA/International, Telephone: 800-582-6480 or 952-894-6280, email contact: chief@chiefmanufacturing.com; or approved equal.

SECTION 115200 – AUDIO-VISUAL EQUIPMENT

2.02 FLAT SCREEN LCD-TV MOUNTING BRACKETS

- A. Bracket Type 1 (Offices):
1. Recessed In-Wall Mount Box #MAC501™ with Swing Arm #JWDIW210B™, with Universal Interface for 26- to 40-inch LCD TV's, including the following features:
 - a. Roll: +/-5-degrees.
 - b. Tilt: ±15-degrees.
 - c. Swivel: 90 degree left/right, for 30-inch flat panel, swivel range varies with screen size.
 - d. Extension: 21.2 inches (538 mm).
 - e. Box Dimensions (H x W x D): 14.5 inches x 14.5 inches x 4.2 inches.
 - f. Color: Black.
 - g. Weight Capacity: 75 lbs (34 kg).
 - h. Accessory: Proximity Component Storage Panel (CSMP 9x12).
- B. Bracket Type 2 (Conference Room, BC Office, Dayroom and Dining Room):
1. Recessed In-Wall Large "ThinStall" Dual Swing Arm Wall Display Mount. Series TS525TU with TA500 in-wall box, with Universal Interface for 42-75-inch LCD TV's, including the following features:
 - a. Roll: +/- 5 degrees.
 - b. Tilt: ± 15 degrees.
 - c. Swivel: 90-degree left/right, swivel range varies with screen size.
 - d. Extension: 25 inches.
 - e. Color: Black.
 - f. Accessory: Proximity Component Storage Panel (CSMP 9x12).
- C. Bracket Type 3 (Bedrooms):
1. Surface Mounted Medium "ThinStall" Dual Swing Arm wall display mount. Series TS318T with Universal Interface for 26-40-inch LCD TV's, including the following features:
 - a. Roll: +/- 5 degrees.
 - b. Tilt: ± 15 degrees.
 - c. Swivel: 90-degree Left/Right, for 30-inch flat panel, swivel range varies with screen size.
 - d. Extension: 18 inches (538 mm).
 - e. Color: Black.
 - f. Accessory: Proximity Component Storage Panel (CSMP 9x12).
- D. Bracket Type 4 (Fitness):
1. Surface Mounted Large THINSTALL Dual Swing Arm Wall Display Mount. Series TS525TU with Universal Interface for 42-75-inch LCD TV's, including the following features:
 - a. Roll: +/- 5 degrees.
 - b. Tilt: ± 15 degrees.
 - c. Swivel: 90-degree left/right, swivel range varies with screen size.
 - d. Extension: 25 inches.

SECTION 115200 – AUDIO-VISUAL EQUIPMENT

- e. Color: Black.
- f. Accessory: Proximity Component Storage Panel (CSMP 9x12).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install mounting brackets and accessories at locations indicated on the Drawings in compliance with manufacturer's written installation instructions.
- B. Securely anchor wall brackets to supporting substrates with vertical edges plumb.

END OF SECTION

SECTION 118129

FACILITY FALL PROTECTION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Roof tie-down system of fall restraint and fall arrest for worker safety.
 - 2. Delegated Design and Deferred Approval of Fall Protection System.

1.02 RELATED SECTIONS

- 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON.
- 2. Section 053000, METAL DECKING.
- 3. Section 054000, COLD-FORMED METAL FRAMING.
- 4. Section 055000, METAL FABRICATIONS.
- 5. Section 055015, ACCESS LADDERS.
- 6. Section 061000, ROUGH CARPENTRY.
- 7. Section 071235, SELF-ADHERED SHEET WATERPROOFING/FLASHING.
- 8. Section 072100, BUILDING INSULATION.
- 9. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING.
- 10. Section 076200, SHEET METAL FLASHING AND TRIM.
- 11. Section 079200, JOINT SEALANTS.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. American National Standard Institute (ANSI):
 - 1. ANSI Z359.1-2007, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.
 - 2. ANSI Z359.6-2009, Specifications and Design Requirements for Active Fall Protection Systems.
- C. Occupational Health And Safety Administration (OSHA):
 - 1. OSHA 1926.50, Fall Prevention Systems Criteria and Practices.

SECTION 118129 – FACILITY FALL PROTECTION SYSTEMS

1.04 SYSTEM DESCRIPTION

- A. General: Provide structural fall restraint and fall arrest system capable of withstanding loads and stresses within limits and under conditions specified in OSHA and other applicable safety codes. Provide fall protection system permanently attached to roof structure. Provide cable lifeline system to allow continuous travel between anchor points.
- B. Design Requirements: Anchors and accessories comprising system of following types:
 - 1. Guardian CB Anchors (or approved equal), spaced as required for safety snap connection by individual workers capable of withstanding a 5,000 lb load or safety factor of 2 meeting the requirements of OSHA 1926.502(d)(8). Sized to accommodate structural roofing assembly indicated in documents.
 - 2. Cable lifeline to pass through intermediate anchor attachment points, restrained at either end by steel shackle and cable fist grips; detaching and reattaching to the system at intermediate anchors required.
 - 3. In-line shock absorber; one each for total lifeline span length up to 60 feet and two each for total lifeline span length greater than 60 feet and up to 100 feet.
- C. Performance Requirements: System and components tested for the resistance of the following loads:
 - 1. Fall Restraint: Four users.
 - 2. Fall Arrest: Two users.
 - 3. Design fall protection anchors to resist a 5,000 lb load applied in any direction at maximum anchor height or provide engineered system designed meeting the requirements of OSHA 1926.502(d)(8).
 - 4. Design system to limit loads on horizontal lifeline anchors to 2,500 lbs.

1.05 SUBMITTALS

- A. Product Data: For each type of device specified, including manufacturer's standard fabrication details and installation instructions.
- B. Delegated Design Documents: Show layout, profiles, and anchorage details. Shop drawings and calculations to be stamped by a Professional Engineer registered in the State in which the project is located. Submit to the City Building Department for a deferred approval.
- C. Maintenance Data: Written instructions for maintenance of fall prevention safety devices to be included in the operation and maintenance manual.
- D. In-house Test Reports: Indicate anchor fabrication compliance with performance requirements.

SECTION 118129 – FACILITY FALL PROTECTION SYSTEMS

- E. Signage: Provide laminated sign showing system layout and usage notes, to be installed at roof access locations.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm having at least 10 years continuous experience in manufacturing fall safety equipment similar to systems specified and exhibiting records of successful in-service acceptability and performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of roof anchors that are similar to those indicated for this Project in material, design and extent.
- C. OSHA Standards: Comply with Occupational Safety and Health Administration Standards for the Construction Industry 29 CFR Section 1926.500 Subpart M (Fall Protection) and with applicable State Administrative Code safety standards for Fall Restraint and Fall Arrest.
- D. Source Limitations: Obtain all roof anchors through one source from a single manufacturer.
- E. Testing: Perform quality control tests for each system per manufacturer's requirements.

1.07 COORDINATION

- A. Contractor to coordinate installation of structural deck to meet requirements of roof anchor manufacturer.
- B. Contractor to coordinate installation of structural deck reinforcements and anchorages to receive fall protection anchors.
- C. Contractor to coordinate placement of roofing system, insulation and flashing to ensure water-tight integrity to roof.

1.08 WARRANTY

- A. Provide manufacturer's standard warranty to guarantee products will be free from defects for a period of 12 months. Warranty period shall become effective on date of substantial completion.

SECTION 118129 – FACILITY FALL PROTECTION SYSTEMS

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Provide fall protection system manufactured by Guardian Fall Protection Inc., 6305 South 231st Street Kent, WA, Phone 800-466-6385, Fax 800-670-7892.
- B. Or equal.

2.02 MATERIALS

- A. CB Anchor Post with swivel top: 2-1/2-inch schedule 80 pipe: Galvanized; paint exposed pipe with marine coating.
- B. CB Anchor Base Plate: Galvanized.
- C. Horizontal Lifeline Kit: stainless steel.
- D. Lifeline cable: stainless steel.

2.03 MANUFACTURED ASSEMBLIES

- A. Guardian Roof Anchors.
- B. Horizontal Lifeline kit: Each kit consisting of 1 or 2 shock absorbers, 1 turnbuckle, 2 or 3 shackles, 6 cable fist grips, 2 thimbles, and 2 O-rings. Provide additional O-rings as recommended by manufacturer.
- C. Lifeline: Continuous wire rope as tested by fall protection device manufacturer to permit worker mobility and safety.

2.04 FABRICATION

- A. Fabricate work true to dimension, square, plumb, level, and free from distortions or defects detrimental to appearance and performance.
- B. Prepare, treat and coat galvanized metal to comply with manufacturer's written instructions. Prepare galvanized metal by removing grease, dirt, oil, flux, and other foreign matter.

SECTION 118129 – FACILITY FALL PROTECTION SYSTEMS

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing and substrate and verify conditions comply with structural requirements for proper system performance.
- B. Proceed with installation of roof anchors only after verifying conditions are satisfactory.

3.02 INSTALLATION

- A. General: Installation of Anchor Posts and Lifeline system to be performed by contractor according to manufacturer's instructions and recommendations.

3.03 FIELD QUALITY CONTROL

- A. Testing: Test on-site 100 percent of anchors relying upon chemical adhesive fasteners using load cell test apparatus in accordance with manufacturer's written recommendations.

3.04 ADJUSTMENT AND INSPECTION

- A. Ensure all manufactured anchors have been installed in accordance with fall protection manufacturer's engineering documentation and specifications.
- B. Provide plan drawings with any deviations in anchor locations as installed.

END OF SECTION

DIVISION 12
FURNISHINGS

SECTION 122413
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes
 - 1. Manually operated window roller shades as scheduled on the Drawings and at the end of PART 3 and as follows:
 - a. Single and double sunshades.
- C. Related Sections:
 - 1. Section 051200, STRUCTURAL STEEL AND MISCELLANEOUS IRON, and Section 054000, COLD-FORMED METAL FRAMING, for framing and blocking for mounting roller shades and accessories.
 - 2. Section 095113, ACOUSTICAL PANEL CEILINGS, for prefabricated metal pockets for roller window shades

1.02 REFERENCED STANDARDS

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 70-08: National Electrical Code.
 - 2. NFPA 701-04: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- B. Window Covering Safety Council (WCSC) (formerly Window Covering Mfrs. Association (WCMA):
 - 1. WCMA A 100.1-07: Safety of Corded Window Covering Products (ANSI).

1.03 SUBMITTALS

- A. General: Submit in conformance with General Requirements, Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

SECTION 122413 – ROLLER WINDOW SHADES

- C. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
- D. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
 - 2. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
- E. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings where applicable.
- F. Product Certificates: For each type of roller shade, signed by product manufacturer.
- G. Qualification Data: For Installer.
- H. Product Test Reports: For each type of roller shade.
- I. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction: Flame-Resistance Ratings: Passes NFPA 701.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of

SECTION 122413 – ROLLER WINDOW SHADES

installation using same designations indicated on Shop Drawings and in a window treatment schedule.

1.06 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements:

1. Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.
2. Allow clearances for operable glazed units' operation hardware throughout the entire operating range.
3. Notify Engineer of discrepancies.
4. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 ROLLER WINDOW SHADES

A. Acceptable Manufacturers:

1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the Contractor.

B. Roller Window Shades:

1. MechoShade and Electroshade Systems, Inc. as manufactured by MechoShade Systems, Inc., Long Island City, NY; Telephone: (718) 729-2020; Website www.mechoshade.com, or approved equal.

SECTION 122413 – ROLLER WINDOW SHADES

2.02 ROLLER SHADE MATERIALS

- A. Shade Band Material: polyvinyl chloride (PVC) coated fiberglass.
 - 1. Fabric Width: As indicated on Drawings with maximum of 96 inches wide (seamless).
 - 2. Pattern and Colors: As schedule at the end of PART 3.
 - 3. Bottom Hem: Straight.

- B. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated on Drawings.

- C. Direction of Roll: Regular, from back of roller.

- D. Mounting Brackets: Galvanized or zinc-plated steel.

- E. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access:
 - 1. Provide fascia end caps, fabricated from steel finished to match fascia.

- F. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

- G. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide exposed-to-view, external-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

- H. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

- I. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner, and bracket lift operator, typical unless otherwise noted.
 - 1. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 - 2. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 - 3. Loop Length: Full length of roller shade.
 - 4. Bead Chain: Stainless steel.
 - 5. Chain Retainer Mounting: Sill.
 - 6. Operating Function: Stop and hold shade at any position in ascending or descending travel.

SECTION 122413 – ROLLER WINDOW SHADES

2.03 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
 - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - 1. Shade Units Installed between (Inside) Jamb: Edge of shade not more than 1/4-inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 - 2. Shade Units Installed Outside Jamb: Width and length per window types, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
 - 1. Colors of Metal and Plastic Components Exposed to View: Match the color of the shade.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

SECTION 122413 – ROLLER WINDOW SHADES

3.02 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.03 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- B. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- D. Replace damaged roller shades that cannot be repaired, in a manner approved by Engineer, before time of Substantial Completion.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City's maintenance personnel to adjust, operate, and maintain roller shades.
- B. Refer to Section 17900, DEMONSTRATION AND TRAINING.

3.05 SCHEDULE OF SHADE TYPES AND FABRICS

- A. Provide the following at all Exterior Windows unless noted below:
 - 1. Single Manual Mechoshades with ThermoVeil 1000 Series Dense Vertical Weave ShadeCloth; color to be selected.
- B. Provide the following at all Sleeping Rooms and at First Floor Conference Room and Second Floor BC Office:
 - 1. Double Manual Mechoshades with Equinox 0100 Series Blackout ShadeCloth #0103 Flax and ThermoVeil 1000 Series Dense Vertical Weave ShadeCloth, color to be selected.
- C. Provide the following at all Interior Doors with full glazing and sidelights:
 - 1. Single Manual Mechoshades with ThermoVeil 1000 Series Dense Vertical Weave ShadeCloth; color to be selected.

END OF SECTION

SECTION 124813

ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes: Entrance floor mats in recessed frames.
- C. Related Sections include the following:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE, for recessing concrete floors to receive frames and mats.

1.02 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM B221-02 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2. ASTM D2047-04 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- B. International Code Council (ICC):
 - 1. ICC A117.1-98: Accessible and Usable Buildings and Facilities (ANSI).
- C. U.S. Architectural & Transportation Barriers Compliance Board:
 - 1. Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG). Adopted in 1991; continual revisions.

1.03 SUBMITTALS

- A. General: Submit in conformance with General Requirements, Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

SECTION 124813 – ENTRANCE FLOOR MATS AND FRAMES

- C. Shop Drawings:
 - 1. Show the following:
 - a. Divisions between mat sections.
 - b. Perimeter floor moldings.
- D. Samples for Initial Selection: For each type of product indicated.
- E. Samples for Verification: For each type of product indicated.
 - 1. Floor Mat: 12-inch-square, assembled sections of floor mat.
 - 2. Tread Rail: 12-inch-long sample of each type and color.
 - 3. Frame Members: 12-inch-long sample of each type and color.
- F. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.
- B. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "ADAAG" and Sections 302 and 303 in ICC A117.1.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If "No Substitutions" is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.

SECTION 124813 – ENTRANCE FLOOR MATS AND FRAMES

4. The burden of proof of equality of proposed products is on the Contractor.
- B. Entrance Mats and Frames:
1. AL-Track 650 as manufactured by Amarco Products, Warren, NJ: Phone: (866) 688-6287; Website: www.amarcoproducts.com.
 2. Or approved equal.

2.02 ENTRANCE FLOOR MATS AND FRAMES

- A. Perimeter Frame:
1. Amarco Model ATF-1002, recessed, level-bed extruded aluminum frame with clear anodized finish.
 2. Frame Profile: Overall depth of 7/16-inch with 3/16-inch exposed perimeter edge.
- B. Rails, Hinges, and Inserts:
1. Rails: Aluminum, extruded profile, assembled at 1-7/8 inches o.c.
 2. Hinges: Extruded vinyl, perforated continuous hinge and support cushion, positively secured between aluminum rails; slotted perforations for drainage.
 3. Tread Inserts (Typical unless otherwise noted):

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats and frames.
- B. Verification of Conditions: Recesses to receive products of this Section are correct size, are within square tolerances and level tolerances.
- C. Surface Preparation: Remove debris from recesses to receive frames; sweep recesses clean.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install recessed-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.

SECTION 124813 – ENTRANCE FLOOR MATS AND FRAMES

- B. Anchor fixed frame members to floor with devices spaced as recommended by manufacturer.

3.03 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring.
- B. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

SECTION 129300
SITE FURNISHINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Ground-mounted bicycle racks installed at exterior location as shown on Drawings.
 2. Wall-mounted back racks installed inside fire station. Location to be determined.
- B. Related Requirements:
1. Section 033000, CAST-IN-PLACE CONCRETE, for installing anchor bolts cast or formed voids in concrete footings.
 2. Section 312313, EXCAVATION AND FILL, for excavation for installing concrete footings.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials International (ASTM):
1. ASTM A53-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 2. ASTM A123-08, Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 3. ASTM A135-06, Specification for Electric-Resistance-Welded Steel Pipe.
 4. ASTM A153-05, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 5. ASTM A500-07, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 6. ASTM A513-08, Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 7. ASTM A924-08, Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

SECTION 129300 – SITE FURNISHINGS

8. ASTM A1011-08, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
9. ASTM C1107-07a, Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

1.04 ACTION SUBMITTALS

- A. General: Comply with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit for each type of product and accessories.
- C. LEED Submittals:
 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 2. Include statement indicating cost for each product having recycled content.
- D. Samples: For each exposed product and for each color and texture specified.
- E. Samples for Initial Selection: For units with factory-applied finishes.
- F. Samples for Verification: For each type of exposed finish, not less than 6-inch-long linear components and 4-inch-square sheet components.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 GROUND MOUNTED BICYCLE RACKS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
 1. Round-Up Bike Rack Model #1700 M1 as manufactured by Patterson Williams Athletic Company, Mesa, AZ, Telephone: (520) 778-4232, Website: www.pwathletic.com,
 2. Or approved equal.
- B. Bicycle Rack Construction:
 1. Type: "Partial Circle Design" for recessed mounting into concrete.
 2. Dimensions: 36 inches high x 42-inch diameter.
 3. Frame: Galvanized steel pipe with O.D. not less than 2-3/8 inches.
 4. Accessories: Base flange covers for each end of anchored pipe.

SECTION 129300 – SITE FURNISHINGS

5. Installation Method: Cast in concrete.
- C. Steel Finish: Galvanized and factory powder coated.
1. Color: Black.

2.02 WALL-MOUNTED BIKE RACKS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide two of the following, installation location to be determined:
1. Wall Rack as manufactured by CycleSafe, Telephone: (616) 954-9977.
 - a. WallRack™ is fabricated of heavy-welded 3/8-inch-diameter steel wire frame with two mounting holes 12 inches apart installed 16 inches o.c., with 12-inch offset to allow for handlebar clearance. Hardware includes two tamper resistant 5/16-inch-diameter lag screws and 5/16-inch lag shields for concrete or block installations.
 - b. Finish: Galvanized and factory powder coated.
 - c. Color: Black.

2.03 MATERIALS GENERAL

- A. Steel and Iron: Free of surface blemishes and complying with the following:
1. Gray-Iron Castings: ASTM A48, Class 35 or better.
- B. Anchors, Fasteners, Fittings, and Hardware: Galvanized steel or Manufacturer's standard, corrosion-resistant-coated or non-corrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.
- C. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
 2. Hot-Dip Galvanizing: According to ASTM A123, ASTM A153, or ASTM A924/.

SECTION 129300 – SITE FURNISHINGS

2.04 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.05 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

SECTION 129300 – SITE FURNISHINGS

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

DIVISION 13
SPECIAL CONSTRUCTION
NOT USED

DIVISIONS 14
ELECTRIC TRACTION
ELEVATORS

SECTION 142100
ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section specifies electric traction elevators.
- B. Work Required
 - 1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator as herein specified.
 - 2. All work shall be performed in a first class, safe and workman-like manner.
 - 3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as required to make complete installation.

1.02 RELATED SECTIONS

- A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.
 - 1. Section 015000, TEMPORARY FACILITIES AND CONTROLS, for protection of floor openings and personnel barriers; temporary power and lighting.
 - 2. Section 033000, CAST-IN-PLACE CONCRETE, for elevator pit and elevator machine foundation.
 - 3. Section 042000, CONCRETE UNIT MASONRY, for hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
 - 4. Section 055000, METAL FABRICATIONS, for pit ladder, divider beams, supports for entrances and rails, and hoisting beam at top of elevator hoistway.
 - 5. Section 071417, SUB-GRADE PRE-APPLIED WATERPROOFING, for waterproofing of elevator pit.
 - 6. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL:
 - a. Main disconnects for each elevator.
 - b. Electrical power for elevator installation and testing.
 - c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
 - d. The installation of dedicated GFCI receptacles in the pit and overhead.
 - e. Lighting in controller area, machine area and pit.
 - 7. Wiring for telephone service to controller.

SECTION 142100 – ELECTRIC TRACTION ELEVATORS

8. Section 263213, GENERATOR SYSTEM, for generator for elevator operation.
9. Section 271300, INTERCOMMUNICATION SYSTEMS, for ADAAG-required emergency communications equipment.
10. Section 283110, FIRE SPRINKLER MONITORING AND ALARM SYSTEM, for fire and smoke detectors at required locations and interconnecting devices, fire alarm signal lines to contacts in the machine area.
11. Section 311000, SITE CLEARING, for excavation for elevator pit.

1.03 REFERENCES

- A. Comply with applicable building and elevator codes at the project site, including but not limited to the following:
 1. ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
 2. ASME A17.7/CSA B44, Performance-Based Safety Code for Elevators and Escalators.
 3. American Disabilities Act Accessibility Guidelines (ADAAG).
 4. ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
 5. ANSI/NFPA 70, (NEC) National Electrical Code.
 6. ANSI/UL 10B, Standard for Fire Test of Door Assemblies.
 7. CAN/ULC-S104-10, Standard Method for Fire Test of Door Assemblies.
 8. ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives.
 9. Building Codes – CBC 2019.
 10. All Local Jurisdictional applicable codes.

1.04 SYSTEM DESCRIPTION

- A. Equipment Description:
 1. Gen3 Edge™ gearless machine, in the hoistway, with the controller located in a machine room.
 2. Equipment Control: Elevonic® Control System.
 3. Drive: Regenerative
 4. Quantity of Elevators: 1
 5. Elevator Stop Designations: 1, 2
 6. Stops: 2.
 7. Openings: Front only.
 8. Travel: 19 feet, 4 inches.
 9. Rated Capacity: 2500.
 10. Rated Speed: 150 fpm.
 11. Platform Size: 6 feet, 6-3/4 inches W x 5 feet, 6-1/8 inches D.
 12. Clear Inside Dimensions: 6 feet, 5-9/16 inches x 4 feet, 3-9/16 inches.
 13. Cab Height: 93 inches.
 14. Clear Cab Height: 7 feet, 4-5/16 inches (2,243 mm).
 15. Entrance Type and Width: Single Slide – 3 feet, 6 inches.

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16. Entrance Height: 84 inches.
- B. Main Power Supply: 208 volts, 5 percent of normal, three-phase, with a separate equipment grounding conductor. Refer to Electrical Drawings to coordinate voltage and phase.
- C. Car Lighting Power Supply: 120 volts, single-phase, 15 amps, 60 Hz.
- D. Machine Location: Inside the hoistway at the top of the hoistway.
- E. Signal Fixtures: State of California Compliant Signal Fixtures
- F. Controller Location: In a machine room.
- G. Performance:
 1. Car Speed: 3 percent of contract speed under any loading condition or direction of travel.
 2. Car Capacity: Safely lower, stop and hold up to 120 percent of rated load (code required).
 3. Ride Quality:
 - a. Vertical Vibration (maximum): 20 milli-g.
 - b. Horizontal Vibration (maximum): 12 milli-g.
 - c. Vertical Jerk (maximum): 4.59 - 1.0 ft./ sec³.
 - d. Acceleration/Deceleration (maximum): 2.62 ft./ sec².
 - e. In Car Noise: 55 – 60 dB(A).
 - f. Stopping Accuracy: 0.375-inch maximum, 0.25-inch typical.
 4. Re-leveling Distance: 0.5 inches.
- H. Operation:
 1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 2. Operation Features – Standard.
 3. Full Collective Operation.
 4. Anti-nuisance.
 5. Fan and Light Protection.
 6. Load Weighing Bypass.
 7. Independent Service.
 8. Firefighters' Service Phase I and Phase II.
 9. Top of Car Inspection.
- I. Door Control Features:
 1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
 2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.

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3. Door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening.
4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

J. Provide Equipment for Seismic Conditions: Yes.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
 2. Cab design, dimensions, and layout.
 3. Hoistway-door and frame details.
 4. Electrical characteristics and connection requirements.
 5. Expected heat dissipation of elevator equipment in hoistway (BTU).
 6. Color selection chart for Cab and Entrances.
- B. Shop Drawings: Submit project specific layout drawings. Include the following:
1. Car, guide rails, buffers, and other components in hoistway.
 2. Maximum rail bracket spacing.
 3. Maximum loads imposed on guide rails requiring load transfer to building structure.
 4. Clearances and travel of car.
 5. Clear inside hoistway and pit dimensions.
 6. Location and sizes of access doors, hoistway entrances and frames.
- C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.
- B. Manufacturer shall have a minimum of 15 years of experience in the fabrication, installation, and service of elevators.
- C. Installer: Elevators shall be installed by the manufacturer.
- D. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

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1.07 DELIVERY, STORAGE, AND HANDLING

- A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.
- B. Should the storage area be off-site, and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.08 WARRANTY

- A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than 1 year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.09 MAINTENANCE AND SERVICE

- A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs, or replacement of parts due to negligence, misuse, abuse, or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.
- B. The periodic lubrication of elevator components shall not be required, including Sheaves, Rails, Belts, Ropes, Car, and CWT guides, etc.
- C. The elevator control system must:
 - 1. Provide in the controller the necessary devices to run the elevator on inspection operation.
 - 2. Provide on top of the car the necessary devices to run the elevator in inspection operation.

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3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
 4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
 5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
 6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
 7. (Optional) Provide the means from the controller to reset elevator earthquake operation.
- D. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:
1. Remotely diagnose elevator issues with a remote team of experts.
 2. Remotely return an elevator to service.
 3. Provide real-time status updates via email.
 4. Remotely make changes to selected elevator functions including:
 - a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak/down peak mode and activate independent service.
 - b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car(s).
 - c. Improve passenger experience: Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: Design based upon Otis Elevator's Gen3™ machine room-less elevator system.

2.02 DESIGN AND SPECIFICATIONS

- A. Provide Gen3™ traction passenger elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:
1. Controller located in a machine-room.
 2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.

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3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
4. Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.
5. LED lighting standard in ceiling lights and elevator fixtures.
6. Sleep mode operation for LED ceiling lights and car fan.

B. Approved Installer: Otis Elevator Company

2.03 EQUIPMENT: CONTROLLER COMPONENTS

- A. Controller: A microcomputer-based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
 2. Controller shall be separated into two distinct halves: Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
 3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC).
 4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity."
 5. Controller located inside a control room.
- B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.04 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.
- B. Governor: The governor shall be a tension type car-mounted governor.
- C. Buffers, Car, and Counterweight: Polyurethane type buffers shall be used for speeds of 150 and 200 feet per minute. Oil buffers shall be used for a speed of 350 feet per minute.
- D. Hoistway Operating Devices:
1. Emergency stop switch in the pit.
 2. Terminal stopping switches.
- E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

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- F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
- G. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. The belts shall have an FT-1 rating as referenced by NFPA 13. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance-based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.
- H. Governor Rope: Shall be steel and shall consist of at least eight strands wound about a sisal core center.
- I. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.
- J. Hoistway Entrances:
 - 1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
 - 2. Sills shall be extruded: Aluminum.
 - 3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
 - 4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.
 - 5. Entrance Finish: Satin Stainless Steel.
 - 6. Entrance Marking Plates: Entrance jambs shall be marked with 4-inch x 4-inch (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
 - 7. Sight Guards: Sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel doors.

2.05 EQUIPMENT: CAR COMPONENTS

- A. Car Frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B," flexible guide clamp type.
- B. Cab: Steel Shell Cab with raised laminate wall panels. Brushed Stainless Steel finished base plate located at top and bottom. Brushed Stainless Steel finished vertical trim pieces between laminate panels are required.
- C. Car Front Finish: Satin Stainless Steel.

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- D. Car Door Finish: Satin Stainless Steel.
- E. Ceiling Type: Dropped ceiling with LED lights
- F. Car Front Finish: Satin Stainless Steel.
- G. Car Door Finish: Satin Stainless Steel.
- H. Ceiling Finish: Brushed Steel Finish.
- I. Floor Finish: Carpet Tile. Refer to Section 096813, TILE CARPETING.
- J. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.
- K. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.
- L. Handrails: Brushed steel finish, 3/8-inch x 2-inch flat tubular bar handrails shall be provided on the side and rear walls.
- M. Threshold: Aluminum.
- N. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- O. Guides: The car shall have 3-inch diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom. Optional counterweight guides available.
- P. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.
- Q. The LED ceiling lights, and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.
- R. Certificate frame: Provide a Certificate frame with a satin stainless-steel finish.

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: A standard applied car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless-steel

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finish. The car operating panel shall contain a bank of round stainless steel, mechanical LED illuminated buttons, flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:

1. The car operating panel shall be equipped with the following features:
 - a. Raised markings and Braille to the left-hand side of each push-button.
 - b. Car Position Indicator at the top of and integral to the car operating panel.
 - c. Door open and door close buttons.
 - d. Inspection key-switch.
 - e. Elevator Data Plate marked with elevator capacity and car number.
 - f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - g. In car stop switch (toggle or key unless local code prohibits use).
 - h. Firefighter's hat (standard USA).
 - i. Firefighter's Phase II Key-switch (standard USA).
 - j. Call Cancel Button (standard USA).
- B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.
- C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation.
 1. Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the entrance frame face. Buttons shall be in vertically mounted fixture. Fixture shall be satin stainless-steel finish.
 2. Button: Flat flush mounted, satin stainless-steel button with blue or white LED illuminating halo
 3. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound.
- D. Access key-switch at top floor in entrance jamb.
- E. Access key-switch at lowest floor in entrance jamb.
- F. Card Reader Provision is not required.
- G. Electrical Requirements
 1. 3-Phase Power MRL: Provide a permanent three-phase electrical-feeder system with a separate equipment-grounding conductor terminating in the elevator controller located at the top landing or transformer located at the

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top of the hoistway. Permanent three-phase electrical-feeder to be terminated at the elevator controller or transformer at the start of installation of the top landing elevator entrance and the timing of connection to Otis controller shall be coordinated with the elevator installer. Feeder conductors and grounding conductor-sized according to elevator current characteristics as shown on the Otis Confirmation of Power Supply form. Feeder conductors and grounding conductors must be copper. Provide a fused disconnect switch or circuit breaker capable of being locked in the open position, for each elevator per the National Electrical Code (ANSI/NFPA 70) or Canadian Electrical Code (C22.1) with feeder or branch wiring to elevator controller [NEC 620-51, 620-61(0), and 620-62] or [CEC Rule 38-013 (2)(a)] located at the point of power distribution in the building. The disconnecting means required by the National Electrical Code or Canadian Electrical Code CEC [Rule 38-051] shall be provided with all associated wiring and conduit to the elevator controller. Size of main contacts to suit elevator power characteristics. Fuses, if provided, are to be current limiting class J or equivalent. Circuit breakers, if provided, are to have current limiting characteristics equivalent to class J fuses. Fuses or circuit breakers are to be time delay to cover the full load up accelerating current. Accelerating current typically is the peak as indicated on the Otis Confirmation of Power Supply Form and lasts for duration not to exceed 7 seconds. Feeder conductors and current associated wiring to the controller to be sized to limit wiring voltage drop to 5 percent maximum when delivering elevator full load up accelerating. The building power system used to operate the elevator(s) shall be capable of supplying non-linear loads and be capable of absorbing the regenerated power listed on the Otis Confirmation of Power Supply form.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Installation of all elevator components except as specifically provided for elsewhere by others.

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3.03 DEMONSTRATION

- A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION

**DIVISIONS 15 TO 20
NOT USED**

DIVISION 21
FIRE SUPPRESSION

SECTION 210000
FIRE SUPPRESSION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Documents:
1. The other Contract Documents complement the requirements of this Section and apply to this Section.
 2. GENERAL REQUIREMENTS, and Section 230013, GENERAL MECHANICAL REQUIREMENTS, apply to the Work of this Section.
 3. Where requirements of this Section exceed those in other Contract Documents, Contractor(s) shall comply with the requirements of this Section.
- B. Codes and Regulations:
1. Comply with regulations and requirements of the local Fire Marshall, local building officials and other authorities having jurisdiction.
 2. Comply with requirements contained in NFPA Standard 13, Installation of Sprinkler Systems, 2019 edition for equipment, specialties, accessories, installation, and testing.
 3. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.
- C. Included: Work includes, but is not necessarily limited to, the following.
1. The Work covered by this shall include furnishing all labor, material, equipment and services to design, install and place in operation, a complete Wet Pipe Sprinkler System in compliance with NFPA Standards and based on current fire hydrant flow test report.
 2. Provide a NFPA 13 hydraulically calculated design which is complete in all regards including, but not necessarily limited to:
 - a. Connection to water main including required valves, fittings, and similar items.
 - b. Underground piping pertaining to the Work of this Section including required pipe, valves, thrust blocks, trenching, backfilling, and similar items.
 - c. Supply Riser, test and drain with required appurtenances and accessories.
 - d. A complete overhead wet sprinkler system.
 - e. Access panels for concealed valves.
 3. Obtain and pay for all licenses, permits, hydrant flow test and report, and fees required for this Work when applicable.

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4. Obtain required approvals for the Fire Suppression System in accordance with the requirements of the Authorities having jurisdiction.
- D. Related work not included in the specification section:
1. All electrical Work, wiring, fire alarm Work, fire extinguishers, monitoring systems and smoke detectors are by others.
 2. Painting of exposed pipe.

1.02 QUALITY ASSURANCE

- A. Installer's responsibilities include designing, fabricating, and installing Fire Suppression Systems and providing professional engineering services needed to assume engineering responsibility. Calculations shall be based on result of Fire-Hydrant flow test.
- B. Welding:
1. Comply with Section IX of the ASME Boiler and Pressure Vessel Code.
 2. Comply with the applicable requirements of AWS B2.1, specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

1.03 PERFORMANCE REQUIREMENTS

- A. Standard piping system component working pressure: listed for 175 PSIG.
- B. Fire Suppression Sprinkler System design shall be approved by the authorities having jurisdiction.
- C. Hazard classification per NFPA 13, Appendix A.
- D. Minimum Density:
1. Light-Hazard Occupancy: 0.10 gpm/sq.ft. over 1,500 sq.ft.
 2. Ordinary – Hazard, Group 1 Occupancy: 0.15 gpm/sq.ft. over 1,500 sq.ft.
- E. Fire Suppression piping shall be seismically braced per NFPA 13, Seismic Zone 4. Calculations and selection and type of hangers and supports shall be included on the drawings.

1.04 SUBMITTALS AND RECORD DRAWINGS

- A. Comply with pertinent provisions of Architectural Sections.
- B. Product Data: Within 35 calendar days after the Contractor(s) has received the "Notice to Proceed," submit six copies of the following:
1. Materials and equipment list of items proposed to be provided under this Section.

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2. Design drawings including Hydraulic Calculations, stamped as having been approved by the Authority having jurisdiction, showing the complete sprinkler system. The location of drain line terminations shall be approved by the Fire Marshal or his agent.
 3. A plan drawing, stamped as having been approved by the Authority having jurisdiction, showing location of underground connections, control valves, and related items.
 4. Fire Hydrant Flow Test Report.
 5. Details and sections as required to clarify the design.
 6. Plans shall conform to appropriate NFPA Standards.
- C. Record Drawings:
1. Include a copy of the Record Drawings in each copy of the operation and maintenance manual described below.
- D. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Architect two copies of an operation and maintenance manual compiled in accordance with the provisions of Architectural Sections of these Specifications.

1.05 PRODUCT HANDLING

- A. Comply with pertinent provisions of Architectural Sections.

1.06 WARRANTY

- A. Contractor shall warrant the installation free from defects for a period of one year from filing Notice of Completion. Correct any deficiencies developing during this period free of charge.
- B. The installer shall be responsible for all damage to any part of the premises caused by leaks or breaks in the piping or equipment furnished and/or installed under this Section of the Work for a period of one year after acceptance of Work.
- C. The above warranties are in addition to and not a limitation of other rights the Owner may have against the contractor under Contract Documents.

PART 2 - PRODUCTS

2.01 PIPING, FITTINGS AND JOINTS

- A. Below grade fire service piping and fittings shall comply with AWWA standards and be listed: "For Fire Protection Service."

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- B. Acceptable Materials:
 - 1. PVC plastic pipe, CL150, CL200 conforming to AWWA C900 with bell spigot ends and factory installed rubber-sealing ring.
 - 2. Fittings: Ductile iron, gray iron, or cast-iron mechanical joints with approved manufactured pipe and fitting restraint system.
 - 3. Ductile iron pipe, bell and spigot, factory provided rubber gasket conforming to ANSI/AWWA C151/A.21.51. Fittings: ductile iron or gray-iron mechanical joints conforming to ANSI/AWWA C110/A21.10 with approved manufactured pipe and fitting restraint system.
 - 4. Refer to NFPA 13 Materials Section for other acceptable piping types and systems.
- C. Above grade fire protection system pipe, tube, and fittings shall be approved and “listed” for use in fire protection systems.
- D. Acceptable Materials: As listed in NFPA 13 Piping Specifications for pipe, tube materials and dimensions.

2.02 SPRINKLER HEADS

- A. Sprinklers shall be UL-listed or FMG approved, with 175-psig minimum pressure rating. Sprinklers shall have 250-psig pressure rating if sprinklers are components of high-pressure piping system.
- B. Available Manufacturers:
 - 1. Central Sprinkler Corp.
 - 2. Globe Fire Sprinkler Corporation.
 - 3. Grinnell Fire Protection.
 - 4. Reliable Automatic Sprinkler Co., Inc.
 - 5. Star Sprinkler Inc.
 - 6. Victaulic.
 - 7. Viking Corp.
- C. Automatic Sprinklers: With heat-responsive element complying with the following:
 - 1. UL 199, nonresidential applications.
 - 2. US 1626, for residential applications.
 - 3. UL 1767, for early-suppression, fast-response applications.
- D. Sprinkler types and categories: Nominal 1/2-inch orifice for “Ordinary” temperature classification rating, unless otherwise indicated or required by application.
 - 1. Orifice: 1/2-inch, with discharge coefficient K between 5.3 and 5.8.
 - 2. Orifice: 17/32, with discharge coefficient K between 7.4 and 8.2.
- E. Sprinkler types, features, and options as follows:
 - 1. Concealed ceiling sprinklers, including cover plate.
 - 2. Extended-coverage sprinklers, with automatic open and shutoff feature.

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3. Flow-coverage sprinklers.
 4. Flush ceiling sprinklers, including escutcheon.
 5. High-pressure sprinklers.
 6. Institution sprinklers, made with a small, breakaway projection.
 7. Open sprinklers.
 8. Pendent sprinklers.
 9. Pendent, dry-type sprinklers.
 10. Quick-response sprinklers.
 11. Recessed sprinklers, including escutcheon.
 12. Sidewall sprinklers.
 13. Sidewall, dry-type sprinklers.
 14. Upright sprinklers.
- F. Sprinkler Finishes: Chrome plated, bronze and painted.
- G. Special Coatings: Wax, lead, and corrosion-resistant paint.
- H. Sprinklers Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
 2. Sidewall Mounting: Chrome-plated steel, one piece flat.
- I. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.
- J. Furnish spare heads, cabinet and tool per NFPA 13.

2.03 SECURITY, SIGNS, TAGS AND CHARTS

- A. Security: Provide chain, padlock or other tamper proof device connected to the Fire Alarm System for each manually operated shutoff valve required to be in the open position.
- B. Signs: Provide identification signs of standard design, fastened securely at designated locations in accordance with NFPA 13.
- C. Tags: Provide 2-inch diameter brass tags, stamped with designation numbers, secured with #12 gage copper wire to spindle of control valves.
- D. Charts:
1. Provide two copies of the "As-Built" sprinkler system diagram, giving the designated number, function, and location of each valve.

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2.04 PIPE HANGERS/EARTHQUAKE PROTECTION

- A. Provide Factory Mutual listed hangers, rods, inserts, and accessories by Grinnel, Tolco or equal. Design and install hangers and supports for seismic Zone 4.

2.05 SUPPLY RISER

- A. The Supply Riser shall be installed where schematically shown on the Drawings or directed by the Fire Marshall and be complete with appurtenances and accessories required by NFPA.
- B. All control valves shall be “listed” indicating type installed with tamper monitoring device and connected to the Fire Alarm System.

2.06 FIRE DEPARTMENT CONNECTION

- A. When required, appropriately lettered wall or free-standing Fire Department Connection(s) shall be provided where schematically shown on the Drawings.
- B. Wall-Type, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to “AUTO SPKR & STANDPIPE.”
 - 1. Type: Flush, with two inlets and square or rectangular escutcheon plate.
 - 2. Type: Exposed, projecting with two inlets and round escutcheon plate.
 - 3. Finish: Polish chrome-plated, rough chrome-plated, polished brass.
- C. Exposed, Freestanding-Type, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass lugged caps, gaskets, and brass chains; brass lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-high, brass sleeve; and round, floor, brass escutcheon plate with marking “AUTO SPKR & STANDPIPE”
 - 1. Finish Including Sleeve: Polished chrome-plated, Rough chrome-plated, Polished brass.

2.07 POST INDICATOR VALVE

- A. A Post Indicator Valve shall be provided where schematically shown on the Drawings. The valve shall be monitored for tampering and connected to the Fire Alarm System.

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2.08 DOUBLE CHECK VALVE ASSEMBLY

- A. An Approved Double Check Valve Assembly shall be provided where schematically shown on the Drawings in accordance with the standards of the local water-servicing agency. The assembly shall be monitored for tampering and connected to the Fire Alarm System.

2.09 FIRE HYDRANT(S)

- A. Provide fire hydrant(s) with shut-off valve and fittings to meet the local Building Department Engineering standards. Locate as shown on the Drawings.

2.10 WATER MAIN CONNECTIONS

- A. Water Main Connections shall be provided where schematically shown on the Drawings per local Building Department or Water District Engineering Standards.

2.11 WALL AND FLOOR PENETRATION SLEEVES

- A. Fire walls and floors:
 - 1. Wall and floor penetrations shall be protected with a UL approved fire rated system. The system shall be per the Drawings Details, and or manufacturer's installation instructions.
 - 2. Fire stopping materials by Hilti, Metacaulk, or Dow-Corning are considered equal. The material shall be the same as called out for the UL-approved system.
- B. Poured concrete walls and floors.
 - 1. Pipes penetrating poured concrete walls and floors shall be protected by providing sleeves per NFPA Standards but not less than the following:
 - a. A Schedule 40 PVC sleeve one size larger than the pipe
 - b. Protection shall end flush with the wall or floor surface.
- C. All walls:
 - 1. Piping passing through walls exposed to view shall be provided with chrome plated split-ring escutcheon plates in finished areas. Brass or galvanized escutcheon plates may be used elsewhere.
- D. At Floors:
 - 1. Pipe sizes 3-1/2 inches and smaller shall have pipe sleeves 2 inches larger than the pipe. For pipes 4 inches and larger the pipe sleeve shall be 4 inches larger than the pipe.

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2.12 GENERAL

- A. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
- B. All fire protection equipment or materials shall be UL listed for fire protection use.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Conditions detrimental to timely and proper completion of the Work shall be brought to the attention of the Architect before the installation of any materials. Do not proceed until unsatisfactory conditions are corrected. Incorrectly installed materials requiring changes will be at Contractor's expense.

3.02 INSTALLATION - GENERAL

- A. Coordinate as necessary with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section.
- B. Install the Work of this Section in strict accordance with the approved design drawings and the requirements of the Authority having jurisdiction.
- C. Perform trenching and backfilling required for the Work of this Section in strict accordance with Section 230013, GENERAL MECHANICAL REQUIREMENTS, pipe manufactures guidelines, and Division 31, EARTHWORK.
 - 1. As a minimum, depth of cover of piping shall be 30 inches (minimum) and 36 inches (minimum) under driveways and 48 inches (minimum) under railroad tracks.
 - 2. Backfill shall be well tamped in layers. No ashes, cinders, refuse, organic or other corrosive materials shall be used as backfill material.
- D. In area having ceilings, conceal all pipes unless directed otherwise by the Architect.
- E. In non-ceiling areas, pipe shall be exposed and routed in the truss space. Where it is not practical to run in the truss space, hold pipes to underside of trusses.
- F. All sprinkler heads shall be arranged in straight rows in both directions, as much as possible. Refer to architects' notes for sprinkler head arrangement.
- G. Do not locate sprinkler heads in any luminous ceiling. Methods for sprinklering such areas shall comply with NFPA.

SECTION 210000 – FIRE SUPPRESSION SYSTEM

- H. Sprinkler heads located where they may easily be damaged, shall be fitted with approved guards.
- I. Cut piping accurately to job measurements and install without springing or forcing. Ream cut pipe to full inside diameter. Insure all filings have been removed from inside of the pipe. Install piping generally square with building, free of traps or air pockets and true to line and grade. Do not install piping in any locations where, in the Architect's opinion, it will interfere with the use of the building; where space is inadequate, notify Architect in time to avoid unnecessary Work. Coordinate and install all piping system without interfering with other trades.
- J. Make up screwed joints with anti-seize thread lubricant applied to male threads only. Threads shall be American-Standard pipe threads.
- K. All low points of the sprinkler system shall have provisions for drainage per NFPA 13. Drain piping shall be run to accessible places approved by the Architect.
- L. Support and brace piping to protect from earthquake damage from structure in accordance with NFPA 13. Do not support piping from ductwork, other pipes, or by resting on the structure.
- M. Provide access panels per Section 230013, GENERAL MECHANICAL REQUIREMENTS, for all concealed valves.
- N. The Fire Sprinkler Piping spacing of vertical supports, lateral bracing, and the details of the lateral bracing must comply with NFPA Standards.
- O. All tees, plugs, caps, bends, and hydrant branches on pipe-installed underground shall be restrained (pipe clamps and tie-rods, thrust blocks, locked mechanical or push-on joints, mechanical joints utilizing set screw retainer glands, or other approved methods) against movement.
- P. All piping shall be painted in compliance of pertinent Architectural Sections.

3.03 CLOSING IN UNINSPECTED WORK

- A. Work in furred areas and below grade and slabs shall not be concealed until such Work has been inspected and approved by the inspecting Authorities. If such Work is concealed without inspection and approval, the installer shall be financially responsible for all Work required to open and restore the concealed areas in addition to any required modification to the system.

SECTION 210000 – FIRE SUPPRESSION SYSTEM

3.04 CLEANUP

- A. During the process of the Work, premises shall be kept reasonably free of all debris, cutting and waste material resulting from the Work under this Section. All such debris and rubbish shall be removed from the site. Upon completion and final acceptance of the Work, all debris, rubbish and left-over materials, tools, and equipment shall be removed from the site.

3.05 TESTING AND INSPECTION

- A. Upon completion of the installation, provide necessary personnel and equipment and test and re-test the complete system making adjustments as required, and secure all necessary approvals.
 - 1. Test the system at 200 psi for 2 hours per NFPA 13.
 - 2. The underground system shall be flushed per NFPA 13 and tested before connection with the overhead section. Backfill the trench between joints before pressure testing to prevent pipe movement.
 - 3. Post Indicating Valves (PIV) shall be tested to insure that the “targets” (OPEN, CLOSED) are clearly identified when valve is opened and closed.
- B. The Contractor shall arrange and pay for all necessary or required inspections by the governmental agencies having jurisdiction to ensure the Work outlined in the Drawings and Specifications complies with the codes. The Architect shall be notified when the Contractor has arranged for inspections.
- C. When the system has been completely approved, secure a Test Certificate from Authority having jurisdiction, and forward two copies of the Certificate to the Architect.

3.06 DISINFECTION

- A. Purge sprinkler piping system including underground system.
- B. Provide water sample to certified water testing laboratory for initial analysis and disinfecting procedure.
- C. Perform purge and disinfecting procedure in accordance with water testing laboratory.
- D. Submit final Water Test Report.

END OF SECTION

DIVISION 22
PLUMBING

SECTION 220000

PLUMBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Documents:

1. The other Contract Documents complement the requirements of this Section and apply to this Section
2. GENERAL REQUIREMENTS, Section 230013, GENERAL MECHANICAL REQUIREMENTS, and Section 019113, GENERAL COMMISSIONING REQUIREMENTS, apply to the Work of this Section.
3. Where requirements of this Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:

1. California Plumbing Code (CPC).
2. California Mechanical Code (CMC).
3. California Building Code (CBC).
4. California Green Building Standard Code.
5. National Fire Code (NFC).
6. National Fire Protection Association (NFPA).
7. Local Building Department.
8. Local Fire Marshal.
9. Office of the State Fire Marshall.
10. California Energy Commission.
11. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.

C. Scope of Work:

1. Material and labor including rough-in for and connection to fixtures, appliances and equipment are:
 - a. Waste and Vent.
 - 1) Soil piping.
 - 2) Drain waste and vent piping (DWV).
 - 3) Indirect waste piping.
 - 4) Auto wash drainage and clarifiers.
 - 5) Trench drains.
 - 6) Floor drains.
 - 7) Traps.
 - 8) Vent flashings.
 - 9) Interceptors and separators.

SECTION 220000 – PLUMBING

- b. Sewers (to 5 feet beyond building):
 - 1) Including metallic or non-metallic piping used to convey sewage and other waste to, and including, connection with offsite utility or on-site treatment and disposal system.
- c. Storm and Sub-Soil Drainage:
 - 1) Roof and overflow drains, including flashing, rain water drainage piping.
- d. Water:
 - 1) Potable water piping systems including pressure reducing valves, relief valves, water hammer shock absorbers.
 - 2) Isolation, zone and control valves.
 - 3) Hot water systems including heaters and storage tanks.
 - 4) Hot water circulating pumps.
 - 5) Piping for water service.
 - 6) Disinfecting of water systems.
 - 7) Insulation of piping and equipment for heat, sound, and vibration.
- e. Kitchen and Laundry:
 - 1) Sinks and dishwashers.
 - 2) Garbage disposers.
 - 3) Washing machines, clothes dryers.
 - 4) Clothes dryer vents.
 - 5) All other equipment with piping connections including kitchen unit combinations.
- f. All Plumbing Fixtures and Supports:
 - 1) Including, but not limited to:
 - a) Sinks, lavatories, water closets, urinals, service sinks, etc., – all materials
 - b) Shower pans, shower receptors, and shower stalls.
 - c) Supports (backing) for all plumbing fixtures and accessories.
 - d) Installation of sinks in or part of drain boards – all materials.
- g. Fuel Gas Piping:
 - 1) Natural and manufactured gas distribution, liquefied petroleum distribution, meters, regulators and connections to all gas-fired equipment.
- h. Air Piping:
 - 1) Compressed air systems including compressor plant.
- i. Pipe Identification, Refer to Section 230013, GENERAL MECHANICAL REQUIREMENTS.
- j. Connections:
 - 1) Utilities-Sanitary sewer, storm drain, water, gas.
 - 2) Hot water tanks.
 - 3) The joining of pipe by any mode or method including, but not limited to, acetylene and arc welding, brazing, lead burning, plastics welding, soldering, wiped joints, caulked joints expanded

SECTION 220000 – PLUMBING

or rolled joints, etc., used in connection with any of the work listed herein.

- k. Layout and Cutting:
 - 1) Holes, chases, channels, the setting and erection of bolts, inserts, stands, brackets, stanchions, supports, sleeves, escutcheon plates, thimbles, hangers, conduits, and boxes.
- l. Excavation, Trenching and Backfill:
 - 1) In connection with plumbing and piping work shown herein.
- m. Pipe Hangers, Supports, Anchors, Guides, Expansion Joints:
 - 1) Including:
 - a) Supports for equipment to which pipe is connected, such as tank supports.
 - b) Isolators-dielectric and vibration.
 - c) Anchors and thrust blocks of concrete, metal, etc.
 - d) Seismic bracing.
 - e) Anvil/Badger, Mason Industries, B-Line/TOLCO or approved equal.
 - f) Seismic hanger system design shall comply with CBC 2013 requirements and ASCE 7-05 and 7-10.
- n. Signs and Notices.
- o. Roof Flashings for Piping Penetrations.
- p. Tests:
 - 1) Piping, for tightness.
 - 2) Equipment for performance.
 - 3) Operating instructions.
 - 4) Final operation.

1.02 ACCESSIBLE PLUMBING FIXTURES

- A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Section 11B-213, 11B-305, and 11B-308.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the Work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

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- C. Welder's Qualifications: Comply with ASME B31.8. The pipe welder shall have a copy of a certified ASME B31.8 qualification test report. Contractor shall also conduct a qualification test. Submit each welder's identification symbols, assigned number, or letter, used to identify work of the welder. Affix symbols immediately upon completion of welds. Welders making defective welds after passing a qualification test shall be given a requalification test and, upon failing to pass this test, shall not be permitted to work this contract.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of Architectural Sections.
- B. Product Data: Within 35 calendar days after the Contractor has received the Notice to Proceed, submit PDF of the following to the Architect for approval prior to acquisition:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications, catalog cuts, and other data needed to prove compliance with the specified requirements. All pieces of equipment shall be clearly identified on corresponding manufacturer's literature being submitted.
 - 3. Shop Drawings or other data as required to indicate method of installing and attaching equipment, except where such details are fully shown on the Drawings.
 - 4. All submittals for the entire project shall be submitted at the same time. Submittals shall be provided in a tabulated three ring binder or in PDF format. Incomplete or noncompliant submittals may be rejected.

1.05 DESIGN CHANGES CAUSED BY PRODUCT SUBSTITUTIONS

- A. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
- B. Acceptance of alternate products by Architect does not change this requirement.

1.06 PRODUCT HANDLING

- A. Comply with pertinent provisions of Architectural Sections.

SECTION 220000 – PLUMBING

PART 2 - PRODUCTS

2.01 WASTE, VENT, SEWER, AND STORM DRAINAGE

- A. Above Grade
 - 1. All waste, vent, sewer and storm lines shall be of cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A888 or ASTM A74 for all pipe and fittings. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.
 - a. Acceptable Manufacturers:
 - 1) AB&I Foundry.
 - 2) Charlotte Pipe and Foundry .
 - 3) Tyler Pipe Company.
 - b. Joints:
 - 1) Joints: For hubless pipe and fittings shall conform to the manufacturer's installation instructions and local codes requirements. Hubless couplings gaskets shall conform to ASTM C1540 and FM 1680 Class 1. Couplings shall consist of a 304 stainless steel shields, clamp assembly and a high-quality elastomeric gasket conforming to ASTM 564. Clamp shall be 4-band constructions, Clamp-All, Tyler 4000 or approved equal.
 - c. Mandatory Referenced Standards:
 - 1) Cast Iron Soil Pipe Institute Standard Specifications – Latest Issue.
- B. CISPI 301: Hubless cast iron soil pipe and fittings for sanitary and storm drain, waste, and vent piping applications.
- C. CISPI 310: Couplings for use in connection with hubless cast iron soil pipe and fittings for sanitary and storm drain, waste, and vent piping applications.
 - 1. ASTM Standard Specifications – Latest Issue.
- D. ASTM A888: Standard Specifications for hubless cast iron soil pipe and fittings.
- E. ASTM A74: Standard Specifications for hub and spigot cast iron soil pipe and fittings.
- F. ASTM C564: Standard Specifications for rubber gaskets for cast iron soil pipe and fittings.
- G. Below Grade:
 - 1. Schedule 40 Solid wall PVC plastic DWV pipe with solvent-cemented drainage pattern fittings complying with ASTM D1785 – Latest Issue.
 - 2. Schedule 40 Solid wall ABS plastic DWV pipe with solvent-cemented fittings complying with ASTM D2661 – Latest Issue.

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- H. Condensate (sized per CMC) and indirect waste drains:
 - 1. Type M Copper Water Tube ASTM B88 with wrought Copper solder fittings, ANSI B16.22.

2.02 DOMESTIC WATER PIPING

- A. Below Grade Water Service Outside Building:
 - 1. 3-inch NPS and smaller, Schedule 40 PVC Plastic Pipe and fittings. ASTM D1785, D2466, with Solvent Cement Joints ASTM D2564.
 - 2. 4-inch NPS and larger, PVC AWWA C900 Class 100 Plastic Pipe with Ductile-Iron fittings AWWA C110, C111 or Elastomeric Gasket Joints.
- B. Above Grade (Distribution System inside building):
 - 1. Piping:
 - a. For soldered, brazed, and mechanical joints, 4 inches and smaller Copper Water Tube Type L Annealed Temper (Hard Drawn) ASTM B75 or ASTM B88.
 - 2. Fittings:
 - a. Wrought Copper Pressure Solder Fittings, ASME B16.22 or ASME B16-25, 95-5 Tin-Antimony Filler Metal.
 - b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
 - c. Copper Unions: MSS SP-123, cast-copper alloy, hexagonal-stock body, with ball-and-socket, met-to-metal seating surfaces, and solder-joint or threaded ends.
 - d. Press Fitting: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Press fittings shall have an inboard bead design.
 - 1) Copper Press Fittings: Viega/Rigid Tool Company, NIBCO, Elkhart/Apollo Xpress or approved equal.
 - 2) 2-inch NPS and smaller: Wrought copper fitting with EPDM-rubber O-ring seal in each end.
 - 3) 2-1/2-inch to 4 inches NPS: Cast-bronze or wrought copper fitting with EPDM-rubber O-ring seal in each end.
 - e. Grooved-Joint Copper-Tube Appurtenances:
 - 1) Basis of Design Product: Subject to compliance with requirements, provide a comparable product by one of the following manufacturers:
 - a) Anvil International.
 - b) Shurjoint Piping Products.
 - c) Victaulic Company.
 - 2) Copper Grooved-End Fittings: ASTM B75 copper tube of ASTM B 584 bronze castings.
 - 3) Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections,

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EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

- f. Copper Push-on-Joint Fittings:
 - 1) Basis of Design Product: Subject to compliance with requirements, provide a comparable product by one of the following manufacturers:
 - a) Cash Acme.
 - b) Elkart.
 - c) Pro Bite.
 - 2) Cast-copper fitting complying with ASME B16.18 or wrought copper fitting complying with ASME B16.22.
 - 3) Stainless Steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.
- g. All underground water piping within the building boundaries shall be ASTM B88-93a Type "L" annealed (soft) copper tube made up without fittings below the floor level.

2.03 GAS PIPING

- A. Below Ground.
 - 1. Polyethylene (PE) Natural and Liquefied Petroleum Gas Yard Piping ASTM D2513 with Fusion Joints. Provide Steel Transition Risers and Detectable Warning Tape.
- B. Above Ground.
 - 1. Schedule 40, Seamless Black Steel Pipe ASTM A 120 2-1/2-inch and smaller with Malleable Iron Threaded fittings ANSI B16.3 Class 150.
 - 2. Schedule 40, Seamless Steel Pipe 3 inches and larger. ASTM A53 with Buttweld Steel fittings ASTM A234.

2.04 COMPRESSED AIR PIPING

- A. Type L Copper, hard drawn with wrought copper pressure fittings and 95-5 tin antimony filler metal.

2.05 FLUE VENT PIPE AND FITTINGS

- A. For condensing equipment: DuraVent PolyPro venting system: Inner pipe a minimum of 2.2-inch-thick polypropylene pipe. Exterior pipe made of Galvalume. ULC-S636 gas vent –BH. Class II venting system, installed per manufacturer's recommendations.

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2.06 VALVES

- A. Acceptable Manufacturers: Milwaukee, Hammond, Jomar, NIBCO, Watts, others as noted.

Type	Size Range	Part Number
Ball	2 inches and smaller (2 piece)	Milwaukee UPBA400 Hammond UP8301A NIBCO 585-80-LF
Ball	2-1/2 inches and larger (3 piece)	Milwaukee UPBA300 Hammond UP8604 NIBCO 595Y-LF
Note: Stem extensions of non-thermal-conductive material and protective sleeve that meets UL 2043 approved for inside air plenum and allows operation of value without breaking the vapor seal shall be used on all insulated pipe. NIBCO NIB-Seal handle or acceptable equal.		
Gate	2 inches and smaller	Milwaukee UP115 Hammond UP645 NIBCO T-113-LF
Gate	2-1/2 inches and larger	NIBCO F-619-RW
Gate-Underground	3 inches and larger	Mueller A-2362 NIBCO F-619-RW
Check-Swing	2 inches and smaller	Milwaukee UP509 Hammond UP943 NIBCO 413Y-LF
Check-Spring	2 inches and smaller	Milwaukee UP548T NIBCO 480Y-LF
Check-Swing	2-1/2 inches and larger	Apollo 61YLF NIBCO F-910-B-LF
Check-Spring	2-1/2 inches and larger	NIBCO F-938-33
Gas Cock (ball)	2 inches and smaller	Milwaukee BA475B Hammond 8901 NIBCO FP600
Gas Cock (plug)	1/2-inch to 4 inches	Homestead 611/612 Walworth 1796/1797 (with wrench)

- B. All compressed air valves shall be ball valves especially made for compressed air service.

2.07 HANGERS AND SUPPORTS

- A. In general, all pipe hangers and supports shall conform to the following except where special pipe hangers and supports are detailed on the Drawings. In all cases hanger and support details on the Drawings shall take precedent over the following:

Piping 6-Inch Size and Smaller		
Items	TOLCO	Anvil
Pipe Hanger	1; 2; 200	260

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Side Beam Clamp for Wood Joist	58	207
Beam Coupling for Steel Beams	65	92
Rod Coupling for Connection to "Hilti"	70	135
Inserts in Concrete Decks	107; 109A; 109AF	N/A
Trapeze Hangers	Tolstrut A12	AS200
Pipe Clamp	TOLCO cush clamp	AS002OD-AS098D

B. Similar items by Anvil International, Erico-Caddy, or TOLCO/B-Line will be acceptable.

C. Hanger Rods shall conform to the following table:

Tube/Pipe Size	Rod Diameter
1/2-inch to 4 inches	3/8-inch
5 inches to 8 inches	1/2-inch
10 inches to 12 inches	5/8-inch

D. Trapeze hangers may be used where parallel runs of pipe occur. All rods on trapeze hangers shall be 1/2-inch minimum size.

E. Hanger Support Spacing shall be as follows unless shown otherwise on the Drawings:

1. Horizontal:

- a. Cast Iron: Every other joint unless over 4 feet, then at every joint.
- b. Copper: Every 6 feet for 1-1/2-inch and smaller, and 10 feet for 2-inch and larger.
- c. Steel, Gas: Every 6 feet for 1/2-inch, 8 feet for 3/4-inch and 1-inch, and 10 feet for 1-1/4-inch and larger.
- d. Schedule 40 PVC or ABS DWV: Every 4 feet for all sizes. Provide for expansions every 30 feet.

2. Vertical:

- a. Cast Iron: Base and every floor not to exceed 15 feet.
- b. Copper: Every floor not to exceed 10 feet.
- c. Steel, Gas: Same as horizontal spacing except 1-1/4-inch and larger at every floor.
- d. Schedule 40 PVC or ABS DWV: Base and every floor with mid-floor guides. Provide for expansion every 30 feet.

F. Refer to the plumbing code for materials not listed above.

G. At all points where insulated pipe contacts a hanger or support, the point of contact shall be protected by metal insulation pipe shield B3153 as manufactured by B-Line. Equivalent pipe protectors will be considered provided the substitute item meets the same standard of quality and performance as the specified item.

H. Seismic restraint devices

- 1. Available Manufacturers:
 - a. Anvil/Badger.

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- b. Mason Industries.
- c. B-Line Tolco Division of Eaton.
2. Seismic hanger system design shall meet the requirements of IBC, CBC, and ASCE 7-05 and 7-10.

2.08 WALL AND FLOOR PENETRATIONS

- A. Fire walls and floors:
 1. Wall and floor penetrations shall be protected with a UL-approved fire rated system. The system shall be per the Drawing Details, or other manufacturer's installation instructions.
 2. Fire stopping materials by Hilti, Metacaulk, or 3M are considered equal. The material shall be the same as called out for in the UL-approved system.
- B. Poured concrete walls and floors:
 1. Pipes penetrating poured concrete walls and floors shall be protected by providing the following:
 - a. A Schedule 40 PVC sleeve one size larger than the pipe or 1/4-inch of foam material wrapped around and secured to the pipe or packed and caulked with mineral wool.
 - b. Protection shall end flush with the wall or floor surface.
- C. All walls and floors:
 1. Piping passing through walls and floors exposed to view shall be provided with chrome plated split-ring escutcheon plates in finished areas. Brass or galvanized escutcheon plates may be used elsewhere.

2.09 FLASHING

- A. All flashing shall be 4 lb sheet lead and all vents penetrating the roof shall be flashed and counter-flashed. Stoneman Co. roof flashing assembly with 10-inch skirt or equal may be used.
- B. The flashing for vents penetrating a metal roof shall have a corrosion resistant aluminum base compatible with the roofing system. A rubber type flashing by "Tech Specialties" shall be installed between the flashing and pipe.
- C. For single ply roofing, provide flashing per roofing manufacturer recommendations or installation instructions.

2.10 CLEANOUTS

- A. Provide cleanouts per Drawings and details on Drawings. Cleanouts as manufactured by J.R. Smith, Mifab, Wade, or Zurn are approved equals.

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- B. Cleanout tops to be installed with tamper-proof screws.

2.11 FLOOR DRAINS, FLOOR SINKS AND ROOF DRAINS

- A. Provide drains as specified on the Plumbing Schedule. Drains as manufactured by J.R. Smith, Mifab, Wade, and Zurn will be acceptable provided they are equal.
- B. Floor sinks by J.R. Smith, Mifab, Wade, Zurn, or Commercial Enameling are acceptable provided they are equal.

2.12 WATER HAMMER ARRESTORS

- A. Provide Wilkins Piston Model #1250XL, Sioux Chief #65X-X, Precision Plumbing Products, or equal, as sized on the Drawings or required by PDI. Install per manufacturer's instructions.

2.13 AUTOMATIC TRAP PRIMERS

- A. Provide Precision Plumbing Products, J.R. Smith, Mifab, or Zurn as specified on the Drawings. Install per manufacturer's instructions.

2.14 PLUMBING FIXTURES

- A. Fixture locations, quantities, types, sizes and connections shall be as shown on both the Plumbing and Architectural Drawings. If a conflict in fixture location is noted between the Plumbing and Architectural Drawings, the Architectural Drawings shall take precedence.
- B. Fixtures shall be thoroughly protected against damage to the chrome plate or enamel, by chipping, scratching or other damage during the entire period of construction. Roof drains, floor sinks and drains, toilet and sink drains, plumbing vents, and all other similar fixtures shall be covered to prevent trash from entering the pipes until final installation of grates, domes, fixtures or other protective devices.
- C. Provide fixtures as specified in the Plumbing Schedule. American Standard, Crane, Elkay, Kohler, or Zurn are acceptable substitutes provided they are equal if approved by Engineer.
- D. Fixture carrier numbers listed are as specified on the Plumbing Schedule; however, carriers as manufactured by J.R. Smith, Mifab, Wade, or Zurn are acceptable provided they are equal.

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2.15 CONNECTORS

- A. Provide Brass Craft "Speedway" or equal heavy pattern iron pipe size brass stops, rigid or flexible supplies and chrome plated brass "P" traps. Stops in "Public" areas are to have screwdriver slots and those in "Private" areas are to have all cross handles.
- B. Provide Brass Craft or equal flexible stainless steel braided water supplies to appliances. They may also be used to fixtures as an option to rigid supplies. Aquaflo is an acceptable substitute.
- C. Provide Brass Craft flexible or equal, stainless steel gas appliance connectors. Dormont is an acceptable substitute. Diameter of connector to be as recommended by manufacturer based on connector length and rated capacity of equipment.

2.16 ACCESS BOXES

- A. See Section 230013, GENERAL MECHANICAL REQUIREMENTS, for access panels.

2.17 PRESSURE GAGES AND THERMOMETERS

- A. Provide Marsh Quality gages or equal with 3-1/2-inch dial, gage cock, in type required.
- B. Provide Terrice 7-inch BX or 3-inch Bimetal Dial series thermometers or equal, straight, angle, or oblique as required, equipped with separable sockets and well. Provide extension necks as required on insulated line.
- C. Arrange gages and thermometers for easy reading.

2.18 PRESSURE REGULATORS

- A. Provide the pressure regulator as specified on the drawings and/or as required by the governmental authority having jurisdiction.
- B. Pressure regulators by Febco, Hersey, Watts or Wilkins are considered equal when their pressure fall-off/loss is equal to or less than the specified regulators/preventer's loss for the given flow rate.

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2.19 WATER HEATERS

- A. Provide water heaters as specified in Plumbing Schedule or approved equal of size, capacity, recovery, and KW/BTUH input. American, A.O. Smith and State are considered equal. Heater shall be AGA- or UL-listed.
 - 1. Heater storage tank shall be provided with magnesium anodes, approved standard pressure/temperature relief valve and all standard factory trim.
 - 2. Gas heaters shall be provided with an AGA-approved 100 percent safety shut-off.
 - 3. Provide approved flexible copper supplies for the water heater water connections.
- B. Provide a Smitty Co., Benjamin Co. with 1-inch drain outlet or equal, water heater pan as specified in the Water Heater Schedule.

2.20 PRESSURE-TEMPERATURE RELIEF VALVE

- A. Pressure-temperature relief valve shall be Wilkins TP220 or TP3000 Series or equal.

2.21 EXPANSION TANK

- A. Expansion tank shall be Wilkins XT series as specified on the Drawings or approved equal in size and capacity. Amtrol and Watts expansion tanks are considered equal.

2.22 WATER HEATER SEISMIC RESTRAINTS

- A. Seismic restraints shall be Spacemaker restraint system Model E-50 or E-100 as applicable for the water heater specified. Spacemaker Model #TSE-25 or Seismik Model #SR-2 may be substituted when first approved by the Engineer.

2.23 PROTECTIVE INSULATION (ADA FIXTURES)

- A. Provide approved manufactured, molded antimicrobial vinyl protective pipe and fitting covering for exposed waste and drain assembly and for hot- and cold-water supplies and stops. Protective system shall consist of pre-formed pipe or tubing sleeve and pre-formed fitting patterns for trap and stops. Assembly shall have integral snap fasteners.
- B. Provide protective covering for off-set drain assembly and disposer at kitchen sinks.
- C. Foam pipe wrap, duct tape, baggy-type covers, tie-strap fasteners are not acceptable.

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- D. Acceptable manufacturers:
 1. Truebro “Lav-Guard”.
 2. Plumberex “Pro-Xtreme”.
 3. Zurn #Z89XX-XX.

2.24 INSULATION

- A. All pipe insulation shall conform to Section 123 of the California Energy Efficiency Standards except to the extent that this Specification supersedes the minimum standards as established by the Code, in which case this Specification shall take precedent. Outside insulation shall be protected with a hard plastic or metal shell covering.
- B. Insulation material shall meet requirements of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM E84, NFPA 255 or UL 723.
- C. Domestic cold-water piping shall be insulated with a minimum 1-inch insulation in unheated areas of the building and where exposed outside of the building.
- D. Domestic hot water piping shall be insulated with Owens-Corning Fiberglass heavy density pipe insulation 25 ASJ/SSL-II (All Service Jacket/Double/ Self-Sealing Lap). Insulation shall be UL-rated non-combustible pipe insulation with a k factor of 0.24-0.28 at 100 deg F mean temperature, an embossed vapor barrier laminated and pressure sealing lap adhesive. All lap and butt strips shall have integral pressure-sensitive strips and shall be applied in strict accordance with manufacturer's instructions.
 1. Closed cell polyethylene foam by IMCOA or equal may be used at Contractor's option provided it meets the above requirements.
- E. Insulation thickness' shown below are based on insulation having a conductivity range of 0.24 to 0.28 per BTU/inch per hour per square foot per deg F temperature of 100 degrees F.

Temperature Range: Above 105 deg F	
Pipe Size	Minimum Insulation Thickness
Run outs up to 2 inches*	1/2-inch
1 inch and less	1-inch
1-1/4 inches – 2 inches	1-inch
2-1/2 inches – 4 inches	1-1/2-inch
5 inches and larger	1-1/2-inch
*Run outs are defined as being less than 2 inches in diameter, less than 12 feet long, and connected to fixtures or individual terminal units.	

- F. Insulation materials not meeting the specified conductivity range shall be submitted for approval and determination of the insulation thickness required.

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- G. Water, soil and waste pipes installed in the exterior walls, attics, crawl spaces or outside the building shall be protected from freezing.

2.25 CIRCULATION PUMP (DOMESTIC)

- A. Provide pump(s) per schedule. Bell and Gossett, Grundfos, Laing or March are considered equal.

PART 3 - EXECUTION

3.01 GENERAL CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Conditions detrimental to timely and proper completion of the Work shall be brought to the attention of the Architect before the installation of materials. Do not proceed until unsatisfactory conditions are corrected. Incorrectly installed materials requiring changes will be at Contractor's expense.
- B. All plumbing fixtures, appliances, and appurtenances furnished with manufacturer's installation instructions shall be installed per those instructions.

3.02 PLUMBING SYSTEM LAYOUT

- A. Lay out the plumbing system in careful coordination with the Drawings. Determine proper elevations for all components of the system and use only the minimum number of bends to produce a satisfactorily functioning system.
- B. Follow the general layout shown on the Drawings in all cases except where other Work may interfere.
- C. Lay out pipes to fall within partitions, walls, or roof cavities, and to not require furring other than as shown on the Drawings.

3.03 PIPING INSTALLATION

- A. Pipe sizes as shown on drawings are Nominal Pipe Size (NPS) or Iron Pipe Size (IPS). Drawings and fixture schedule indicate pipe sizing per the CPC and Standard Engineering Practice. Pipe sizes shall be maintained to fixtures, appliances and equipment. Approved reducing fittings shall be installed at all points of connections.
- B. Install piping generally square with building, free of traps or air pockets, and true to line and grade. Keep all piping tight to the building structure, unless pipe slope is required. Do not install piping in any locations where, in the Architect's opinion,

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it will interfere with the use of the building or create a safety hazard. Where space is inadequate, notify the Architect in time to avoid unnecessary Work. Install all exposed piping as high as possible without interfering with other trades.

- C. Make changes in direction with manufactured fittings; use long radius elbows. Street elbows, bushings, close nipples and bending of pipe or tubing will not be allowed.
- D. Provide "P" traps at sanitary sewer drainage devices without integral traps.
- E. All natural-gas piping under structures or concrete slabs will be installed in a protective vent sleeve. Sleeves under a building will be vented to outside the building per detail on Plans. Sleeves under concrete slabs will extend a minimum of 1-foot beyond the slab. All sleeves will be sloped 1/8-inch per foot up toward the vented end. The vent end of sleeves under slabs will terminate under a landscaped or asphalted area.
- F. Gas piping shall be tapped off the top or side of pipe and ends of mains shall be provided with dirt legs.
- G. Underground plastic pipe will horizontally transition to metal pipe 5 feet before the above ground riser. Install plastic pipe with a minimum of 36 inches of cover when located under areas of possible vehicle traffic. Approved metallic pipe must be used if the minimum depth is not met. A tracer wire, terminating at each end at an exposed location, will be installed with all underground plastic pipe. Gas piping will also have a continuous tape marked "Gas" laid 6 inches above it.
 - 1. Piping may terminate a maximum of 1-foot above ground when encased in a listed metallic transition riser.
- H. Use friction wrenches when installing brass, polished, or soft metal piping, and when installing piping exposed in finished areas. Replace piping showing wrench marks.
- I. Attach escutcheon plates to pipes with set screws or spring clamps with concealed hinges. Continue insulation through escutcheon plates.
- J. Compressed air piping shall be adequately supported in a manner that eliminates all sags and bowing of the line. All horizontal runs shall be straight and sloped at 1 percent to the indicated drain. All branch or individual drop lines shall be taken off the top of their supply line.
- K. General:
 - 1. Proceed as rapidly as the building construction will permit.
 - 2. Thoroughly clean items before installation. Cap pipe openings to exclude dirt until fixtures are installed and final connections have been made.
 - 3. Cut pipe accurately, and work into place without springing or forcing, properly clearing windows, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.

SECTION 220000 – PLUMBING

4. Show no tool marks or threads on exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.
5. Provide sufficient swing joints, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings.
6. Support piping independently at pumps, coils, tanks, and similar locations, so that weight of pipe will not be supported by the equipment. Support the equipment independently from the pipe.
7. Pipe the drains from mechanical equipment, drip pans, relief valves, air vents and similar locations, to an open sight drain, floor drain, or other acceptable discharge point, and terminate with an air break or air gap per CPC.
8. Securely bolt all equipment, isolators, hangers, and similar items in place.

3.04 PIPE SUPPORT INSTALLATION

- A. Support pipes from structure with assemblies specified. Provide auxiliary members, anchors, guides, and sway braces necessary to maintain pipe alignment and prevent excessive movement or strain on piping system or components; allow for expansion and contraction of piping. Provide at least one hanger for each branch. Do not use powder driven fasteners, wire, perforated tape, nails, wood blocking, or other makeshift devices to support pipe.
- B. Attach supports to structure with bolts, screws or concrete anchors, per support manufacturer's requirements.

3.05 JOINTS AND CONNECTIONS

- A. Cut pipe shall be reamed to full inside diameter of pipe. Cut threads straight and true. Insure all filings have been removed from inside of the pipe. Apply liquid Teflon to male pipe threads and not inside fittings. Use graphite on cleanout plug threads.
- B. Joints in cast iron "No-Hub" soil/waste pipe and fittings shall be made up with neoprene gaskets and stainless-steel bands conforming to CISPI 310, torque to the manufacturer's specification with an approved torque wrench. Joints in hub and spigot shall be made up with compression gaskets conforming to ASTM C564.
- C. Joints in copper tube shall be made with 95-5 tin-antimony or lead-free solder, applied in strict accordance with the manufacturer's directions.
- D. Dissimilar metals shall be isolated with dielectric couplings, "EPCO" or approved equal. Provide access panels at all hidden couplings.

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- E. All plastic pipe shall be joined in accordance with the manufacturer's recommendations for their pipe and IAPMO Installation Standard per the latest edition of the CPC.
- F. Press Connections: Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
- G. Pipe Protection: Provide protection against abrasion where copper tubing is in contact with other building members by wrapping with an approved tape, pipe insulation or otherwise suitable method of isolation.
- H. Penetration Protection: Provide allowance for thermal expansion and contraction of copper tubing passing through a wall, floor, ceiling or partition by wrapping with an approved tape or pipe insulation, or by installing through an appropriately sized sleeve. Penetrations of fire resistance rated assemblies shall maintain the rating of the assembly

3.06 SANITARY SEWER, VENT, AND INDIRECT WASTE SYSTEM INSTALLATION

- A. Install horizontal drainage piping at a minimum 2 percent, condensate 1 percent, slope unless otherwise noted. Where this is impractical notify the Architect before installing the pipes.
- B. Install vent piping to drain back into the sewer system.
- C. Provide cleanouts where shown on Drawings and where required by governmental agencies having jurisdiction.
 - 1. All cleanouts to grade shall be firmly secured by means of a concrete block 20 inches square by 5 inches thick, and shall be flush with finished grade, unless otherwise noted on the plans.
- D. Provide automatic trap primers as specified at floor sinks and drains as indicated on Drawings or where required by governmental agencies having jurisdiction. Provide access panels for all hidden mechanical trap primers.

3.07 FLUE VENT PIPE INSTALLATION

- A. All flues or vents shall terminate above the roof with flashing and a listed vent cap installed in accordance with its listing and the manufacturer's instructions. Vent cap shall be of the same manufacturer as the flue pipe. Flues or vents shall terminate per the latest Edition of the CPC.

SECTION 220000 – PLUMBING

3.08 VALVE INSTALLATION

- A. Provide valves in the water, air, and gas systems. Locate and arrange so as to give a complete regulation of apparatus, equipment, and fixtures.
- B. Provide valves in at least the following locations:
 - 1. In branches and/or headers of water piping serving a group of fixtures.
 - 2. On both sides of apparatus and equipment.
 - 3. For shutoff of risers and branch mains.
 - 4. For flushing and sterilizing the system.
 - 5. Where shown on the Drawings.
- C. Locate valves for easy accessibility and maintenance. Provide access panels for all hidden valves.
- D. Unions shall be installed downstream of all screwed valves.
- E. All gas pressure regulating valves shall be vented to the atmosphere.

3.09 WATER HAMMER ARRESTOR INSTALLATION

- A. Provide water hammer arrestor on cold water lines.
 - 1. Install at all quick closing valves, solenoids, and supply headers at plumbing fixture groups.
 - 2. Locate and size as shown on Drawings, and where not shown, locate in accordance with Plumbing and Drainage Institute Standard WH-201.
 - 3. Install water hammer arrestor behind access panels.

3.10 PLUMBING FIXTURE INSTALLATION

- A. Connect plumbing services to fixtures as shown on Drawings and as specified.
- B. Provide and install compression stops and flexible supplies per fixture manufacturer's recommendation or as high as possible on wall directly below fixtures.
- C. Install fixtures at right angles to, and tightly against, building surfaces, and in proper alignment. Fill gaps between fixtures and building surfaces with white grout. Mounting heights and locations shall be as shown on the Drawings, or, if not shown, as directed by the Architect.

3.11 INSULATION INSTALLATION

- A. Ensure surfaces are clean and dry surfaces to application of insulation or adhesives.

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- B. Insulate piping, fittings, valves, and strainers. Leave unions exposed. Where insulation terminates, bevel ends of insulation and continue jacket over insulation and secure to pipe. Do not interrupt insulation at hangers, supports, clamps, or penetrations through structure. Fittings shall be finished with "Zeston" or approved equal fitting closures. If fitting closures not available, use 8 oz canvas dipped in "Seal-Fas".
- C. Attach longitudinal jacket laps and butt strips with factory applied pressure sensitive adhesive. On concealed piping only, outward clinching coated staples at 2-inch spacing may be used. Cover elbows with one-piece polyvinyl chloride covers. Secure with tack fasteners. Tape ends of covers with matching tape on exposed piping. Seal off all cut ends with canvas and Benjamin Foster 30-36.
- D. Install closed cell polyethylene foam per manufacturer's instructions.

3.12 TESTING AND ADJUSTING

- A. Provide personnel and equipment, and arrange for and pay the costs of, all required tests and inspections required by governmental agencies having jurisdiction. See Section 230013, GENERAL MECHANICAL REQUIREMENTS, for test requirements.
- B. Where tests show materials or workmanship to be deficient, replace or repair as necessary, and repeat the tests until the specified standards are achieved.
- C. Adjust the system to optimum standards of operation.

3.13 CLEANING (for Potable Water Systems)

- A. Disinfection: The hot- and cold-water distribution system shall be disinfected prior to being placed in service. The system shall be disinfected within 3 weeks of occupancy in accordance with AWWA C651 or the following requirements:
 - 1. The piping system shall be flushed with potable water until discolored water does not appear at any of the outlets.
 - 2. The system shall be filled with a water chlorine solution containing at least 50 ppm of chlorine. The system shall be valved off and allowed to stand for 24 hours or the system shall be filled with a water chlorine solution containing at least 200 ppm of chlorine. The system shall be valved off and allowed to stand for 3 hours.
 - 3. Following the standing time, the system shall be flushed with water until the chlorine is purged from the system.
 - 4. Provide bacteriological sampling and analysis results to the Engineer for review.

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3.14 WARRANTY

- A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or owner.

END OF SECTION

DIVISION 23
HEATING, VENTILATION
AND AIR CONSITIONING

SECTION 230000

HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Documents:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, GENERAL REQUIREMENTS, Specification Sections, apply to this Section.
2. Section 019113, GENERAL COMMISSIONING REQUIREMENTS.
3. Where requirements of the Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:

1. In addition to complying with the specified requirements, comply with pertinent regulations of the Authority Having Jurisdiction. All work must comply with the version of the code that was in affect at the time of the initial permit submittal.
 - a. California Building Code (CBC).
 - b. California Residential Code.
 - c. California Electrical Code.
 - d. California Mechanical Code.
 - e. California Plumbing Code.
 - f. California Energy Code.
 - g. California Fire Code.
 - h. California Existing Building Code.
 - i. California Green Building Standards Code (CALGreen).
 - j. Reach Codes that have been adopted by the Authority Having Jurisdiction.
 - k. National Fire Protection Association (NFPA).
 - l. Local Building Department.
 - m. Local Fire Marshall.
2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.

C. Included: Work includes, but is not necessarily limited to, the following.

1. The Work covered by this Specification shall include furnishing labor, material, equipment, and services to construct, install and place in operation, the complete Heating, Ventilating and Air Conditioning Systems to the extent as indicated, and as shown on the Drawings and specified

SECTION 230000 – HEATING, VENTILATION, AND AIR CONDITIONING

herein. The Work covered under this Section shall hereinafter be referred to as the Mechanical System.

2. A system of temperature controls shall be furnished and installed complete as hereinafter described. Low voltage wiring and conduit, complete with electrical accessories and materials as required for the installation of the temperature control system shall be furnished and installed under this Section of the Contract but shall conform to the Specification requirements as set forth under Division 26, ELECTRICAL.
 3. Variable Refrigerant Volume Systems:
 - a. Condensing Units.
 - b. Refrigerant Control Boxes (Branch Selector Boxes, Heat Recovery Units).
 - c. Fan Coils.
 - d. Central Controllers.
 - e. Special Pipe Fittings (Headers, Y-branches).
 4. Energy Recovery Ventilators.
 5. Fan Coil Units.
 6. Condensing Units.
 7. Heat Pump Units.
 8. Centrifugal Exhaust Fans and Roof Exhausters.
 9. Duct systems complete with supports, dampers, grilles, registers, diffusers and louvers:
 - a. Supply Air.
 - b. Return Air.
 - c. Exhaust Air.
 - d. Outside Air.
 - e. Combustion Air.
 - f. Product Conveying Systems.
 10. Filters and Filter Boxes.
 11. Duct, Pipe and Equipment Insulation.
 12. Low Voltage Controls.
 13. Refrigerant Piping.
 14. Fire Life Safety Devices:
 - a. Smoke Dampers.
 - b. Radiation Dampers.
 - c. Fire Dampers.
 - d. Combination Fire/Smoke Dampers.
 - e. Duct Smoke Detectors.
 - f. Fire Stop Systems.
 15. Vibration Isolators.
- D. Work Not Included In This Section:
1. Blocking, framing and wood supports required for the purpose of accommodating the Mechanical System unless specifically called for under this Division. The contractor is responsible for the correct location of such items and shall bear the expenses covering their omission or improper location.

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2. Electrical connections to motors, electric starters, disconnect and over-current protective devices, unless specifically called for by this Section, or unless the equipment is furnished as an integral part of the Mechanical System Equipment, as hereinafter specified, or noted on the Drawings.
3. Line voltage electrical wiring and conduit, except where specifically called for on the Drawings or hereinafter in this Section.
4. Painting, except when supplied as factory finish, or specifically called for in this Section or on Drawings.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the Work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

1.03 SUBMITTALS

- A. If the heating and/or air conditioning equipment is substituted with a different brand or model than that specified on the Drawings the Authority Having Jurisdiction may require the energy compliance calculations to be updated. The contractor shall be responsible for all cost related to updating the calculations. If the substituted equipment does not comply the contractor shall be responsible for providing equipment that meets or exceeds the performance of the specified equipment at no additional cost to the Owner.
- B. Comply with pertinent provisions of Architectural Section.
- C. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit six copies of the following to the Architect for approval prior to acquisition:
 1. Materials list of items proposed to be provided under this Section including, but not limited to heating, ventilating and air conditioning equipment and mountings, air distribution equipment, ductwork and fittings, flexible ductwork, flue vent pipe, duct specialties, flexible connections, insulation, lining and adhesive, duct joint sealer, temperature controls, piping and accessories.
 2. Manufacturer's specifications, cut sheets, and other data needed to prove compliance with the specified requirements. All pieces of equipment shall

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be clearly identified on corresponding manufacturer's literature being submitted. All information for each item shall be correlated.

3. Shop Drawings or other data as required to indicate method of installing and attaching equipment, ductwork and piping except where such details are fully shown on the Drawings.
4. Submittals for entire Project shall be submitted at the same time or may be rejected until all are included in one submittal package.
5. Submittals shall be provided in pdf format.

1.04 DESIGN CHANGES CAUSED BY PRODUCT SUBSTITUTIONS

- A. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
- B. Acceptance of alternate products by Architect does not change this requirement.

1.05 PRODUCT HANDLING

- A. Comply with pertinent provisions of Architectural Sections.

PART 2 - PRODUCTS

2.01 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

- A. Heating, Ventilating, and Air Conditioning Equipment: Equipment shall be as specified on the Drawings. All other equipment shall be pre-approved by the Mechanical Engineer.
- B. It shall be the responsibility of the Contractor to see that any substituted equipment performs similarly to that which is specified and fits in the same area as specified. Cost of any additional Work caused by the substitution of equipment shall be borne by the Contractor.

2.02 AIR DISTRIBUTION EQUIPMENT

- A. Grilles, registers and ceiling diffusers and other accessory equipment shown on the Drawings and "Grille, Register and Diffuser Schedule" shall be manufactured by Titus unless shown otherwise.
- B. Any substitutions of the above equipment which may be proposed by the Contractor shall be re-sized to suit his equipment by the proposed manufacturer and submitted in tabular form listing components proposed for each location in the System, identifying each as to location, design, air quantity passing through the devices, pressure drop, noise criteria data, velocities of air leaving the device

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and "K" flow factors for each item. Manufacturer's data sheets showing dimensions and recommended method of installation for each component must also be included.

2.03 CONTROL DAMPERS

- A. In all other locations provide Greenheck model VCD-23, class 1 at 4 inches wg as scheduled on plans. Damper frame shall be stainless steel, formed into a 5-inch x 1-inch structural hat channel. Blades shall be 16-gauge stainless steel strengthened by three longitudinal 1-inch-deep Vee grooves running the entire length of each blade. Blade seals shall be Silicone. Jamb to be flexible stainless steel compression type. The linkage shall be concealed in the frame out of the air stream, stainless steel material. The Axle shall be stainless steel. Bearings to be stainless steel. Finish shall be Hi-Pro polyester power coated.

2.04 LOUVERS

- A. 4" deep louvers, Greenheck, Model ESJ-401, or approved equal. Deflection blades shall be spaced on 4-inch centers having 1/2-inch-high vertical baffle and an additional lateral center rain hood. The edges of louver blades shall be folded or beaded to exclude driving rain. Louvers blades shall be oriented to minimize the entrainment of rainwater. Louver blades, heads, sills, jambs, braces and mullions shall be made of aluminum. Louvers shall be provided with flanges.
- B. Provide 1/2-inch aluminum bird screen on outside air intake louvers and 1/4-inch aluminum insect screen on combustion air louvers.

2.05 RECTANGULAR SHEET METAL DUCTWORK

- A. Rectangular supply, return, outside air and exhaust ducts, single leaf dampers and plenums shall be fabricated from prime grade galvanized steel sheets of lock form quality and shall be constructed in accordance with appropriate tables of the latest ASHRAE "Guide and Data Book" and SMACNA "HVAC Duct Construction Standards" handbook and Chapter 6 of the 2019 CMC.
- B. Transverse Duct Joints shall be made with The Ductmate System. When using The Ductmate System, construction of the duct such as gage, reinforcing, etc. shall be as indicated in the latest addition of the applicable SMACNA standards. With proper data, an equal may be submitted, providing the corners have a downset and corner clips to insure airtight integrity. Testing must be done by a nationally recognized testing laboratory. The standard Ductmate 35 System joint is the equivalent of a SMACNA "J" connection. The Ductmate 25 System joint is the equivalent of a SMACNA "F" connection. The installation of the Ductmate System shall be in accordance with the latest manufacturer's printed Assembly and Installation Instructions.

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- C. Each duct or plenum shall be diagonally cross-broken for rigidity.
- D. Duct bends, fittings, transitions, etc. shall be fabricated in accordance with Fabrication Standards as shown on the Drawings or in accordance with latest SMACNA "HVAC Duct Construction Standards" where not shown on Drawings.
- E. Support ducts to joists or similar structural members. Except where indicated otherwise, ducts with a side of 24 inches or more shall be supported on Ductmate trapeze duct hangers consisting of 2-inch high x 1-1/2-inch wide x 18-inch gauge channel and 3/8-inch diameter hanger rods hung from support brackets bolted to structural members. See also Special Fabrications as shown on the Drawings. Duct supports shall be 8 feet maximum on center.
- F. At branch ducts, provide manually operated dampers of the type and arrangement shown on the Drawings, two gages heavier than the duct (if single leaf type) in which installed, and equipped with locking quadrants and closed end bearings.
- G. Sizes shown on Drawings are net inside dimensions. Enlarge duct to accommodate lining.

2.06 ROUND DUCTWORK AND FITTINGS

- A. Two- to 10-inch wg round duct through 61-inch in diameter shall be United Sheet Metal spiral lockseam unseal duct, or approved equal, manufactured from galvanized steel meeting the ASTM A-527-71 in the following gages:

Diameter	Metal Thickness
3-13 inches	26 gauge
14-23 inches	24 gauge

- B. Round duct shall be new and exclusively obtained for this project. Each piece shall be in 20-foot lengths. Ducts shall be cut to length required with joints only at fitting locations, except on duct runs longer than 20 feet.
- C. Spiral duct and fitting connections, 15-inch diameter and larger shall be Ductmate Spiralmate round duct connectors. The connector system shall consist of two mating round duct connector flanges roll-formed from hot dipped galvanized steel with an integral sealant and closure ring roll-formed from hot dipped galvanized steel.
- D. Fittings shall be United Sheet Metal galvanized fittings in the following gauges:

Diameter	Metal Thickness
3-13 inches	24 gauge
14-23 inches	22 gauge

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- E. Spiral duct fittings must be manufactured as separated fittings and shall not be saddle taps, stubs or tap-in fittings tapped into spiral duct, nor may they be dove-tailed tap-ins into pipe or fittings.
- F. Reducers shall occur after a branch tap occurs on the main portion of the fitting. Divided-flow fittings shall be used unless shown otherwise on the Drawings.
- G. Joints on ducts and fittings shall be covered and sealed with 4-inch wide, 6 oz canvas saturated with Arabol lagging adhesive, or Hardcast DT tape in conjunction with Hardcast FTA-20, non-flammable, non-toxic adhesive, or GlenKote duct sealer or other approved mastic type sealer. Duct tape will not be allowed. Where exposed to weather, paint lagging strips with two coats of silver enamel paint.
- H. All ductwork shall be constructed in accordance with appropriate tables of the latest ASHRAE “Guide and Data Book” and SMACNA “HVAC Duct Construction Standards” handbook and Chapter 6 of the 2019 CMC. Duct gauges to be in accordance with Sections 2.6.A and 2.6.D of this Specification.
- I. At branch ducts, provide manually operated dampers of the type and arrangement shown on the Drawings, two gages heavier than the duct (if single leaf type) in which installed and equipped with locking quadrants and closed end bearings.

2.07 FLEXIBLE DUCT

- A. Flexible air duct shall be Hart & Cooley Model F218. Duct shall consist of an inner core having two layers of polyester film encapsulating a steel wire helix surrounded by a blanket of fiberglass insulation and sheathed in a metalized polyester vapor barrier reinforced with fiberglass scrim. All air ducts shall be UL listed under the UL 181 standard as a Class 1 Air Duct also conforming to NFPA Standards 90A and 90B. This air duct shall have a certified thermal resistance rating of R-8 in accordance with ASTM C518 at 75 deg F and carry the ADC “Thermal Performance” seal.
- B. To make the connection, in no case shall any section of flexible duct exceed 5 feet in length.
- C. Use two layers of UL-listed 181 duct tape to connect flexible duct to the metal duct if flexible duct does not have SM collars.
- D. The number of bends shall not exceed a combined total of 90 degrees; 90-degree bends will not be allowed at diffuser connections.

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2.08 FLUE VENT PIPE AND FITTINGS

- A. Type B double wall vent pipe with UL label shall be used for gas burning appliances, except gas wall furnaces and gas appliances with power burners. Install per manufacturer's recommendations.
- B. Flues or vents shall terminate above the roof or through exterior walls with flashing and a listed vent cap installed in accordance with its listing and the manufacturer's instructions. Flues or vents shall terminate as required per current CMC.
- C. Vent cap shall be of the same manufacturer as the flue pipe.

2.09 DUCT SPECIALTIES

- A. Damper Regulators and Bearings: Duro-Dyne "Specline" SR-Series or approved equal, lever type with matching end bearing. Regulator set shall include rubber gasket between regulator and duct, spring washer between core and housing, wedge pin, dial indicator and handle. Matching end bearing shall be closed end with rubber gasket:

Model	Size
148	10 inches and Under
388	20 inches and Under
128	21 inches and Above

- B. Access Panels: Access panels shall be located at all points where adjustable mechanisms are installed internal to, or on the surfaces of, the ductwork. Where adjustable mechanisms are concealed by walls or ceilings, "Elmdor" or approved equal access doors shall be installed. Size shall be suitable for convenient servicing.
- C. Tile Walls: Doors and Frame: Stainless Steel. Other areas: recess type to receive ceiling or wall finish in order to provide "Blind Finish".
- D. Fire and Fire/Smoke Dampers: Fire dampers shall be installed where shown on the Drawings and/or required and shall be of a type approved by the UL Laboratories, Inc. and the State of California Fire Marshal. Dampers shall be installed per manufacturer's instructions. Provide access door in duct at each fire damper such that damper is easily accessible.
- E. Volume Dampers:
 - 1. In rectangular ducts greater than 1-1/2 square feet, provide Pottorff Model CD42, or equal, factory fabricated opposed blade damper, 16-gauge blades, and brass bearings. Blade width shall not exceed 6 inches.
 - 2. In rectangular ducts 1-1/2 square feet and less, provide single leaf dampers as described in Section 2.3 (a. and g.) of this Specification.

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3. In round ducts 15 inches in diameter and less, provide shop fabricated galvanized sheet metal plate dampers. Plate shall be 18 gauge or shall be two even gauges heavier than duct; minimum thickness 22 gauge. Provide stiffening beads at one-third points in dampers lighter than 18 gauge.
 4. In round ducts 16 inches and greater, provide Pottorff opposed blade damper Model CD22R or approved equal.
 5. In round ducts 4 inches to 24 inches in diameter, above “hard” ceilings, provide DuroZone Cable Operated Damper. Cable length to be between 3 feet and 15 feet long. Contractor to determine proper length to be use. Cable shall be routed inside the duct to the face of the grille or diffuser. Tuck cable up behind diffuser after balancing.
- F. Provide 20-gauge galvanized sheet metal escutcheon plates at duct penetrations of finished building surfaces. Install tight against surface and securely attached to duct. Continue insulation through openings.
- G. Duct Mounted Access Doors:
1. In rectangular duct provide, DuroDyne Model IAD, Ductmate "Sandwich", or equal, insulated, duct mounted access doors with Cam-Lock operated latches where shown on drawings or required for access to duct mounted equipment. Doorframe shall be 24-gauge with double wall door and 1/2-inch glass fiber insulation. Size doors to provide easy access to equipment.
 2. In round ducts, provide Ductmate – METU round duct access doors, fully insulated, with attached gasket and springs between inner and outer door. Access doors shall be as large as practical as duct size will allow.

2.10 FLEXIBLE CONNECTIONS

- A. Provide fireproof, insulated, non-porous, flexible connections between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connections by zinc coated steel clinch-type drawbands. Flexible connections shall be DuroDyne "Insulfab" or "Insulflex" or approved equal.
- B. Provide a duct support next to each flex connector to prevent any strain on connection.

2.11 PIPE HANGERS AND SUPPORTS

- A. In general, pipe hangers and supports shall conform to the following except where special pipe hangers and supports are detailed on the Drawings. In cases hanger and support details on the Drawings shall take precedent over the following:

Pipe 6-Inch Size and Smaller	
Items	Superstrut Number
Pipe Hanger	710

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Side Beam Clamp for Wood Joist	540
Beam Coupling for Steel Beams	U563-U562
Rod Coupling for Connection to “Hilti”	H-119
Inserts in Concrete Decks	
Trapeze Hangers	A1200-A1202
Pipe Clamp	A716 or 701W/S-716

B. Similar items by Unistrut, Securstrut, Michigan, or B-Line will be acceptable.

C. Hanger Rods shall conform to the following table:

Tube/Pipe Size	Rod Diameter
1/2-inch to 4 inches	3/8-inch

D. Hanger Support Spacing shall be as follows unless shown otherwise on the Drawings:

1. Horizontal:
 - a. Copper: Every 6 feet for 1-1/2-inch and smaller, and 10 feet for 2-inch and larger.
2. Vertical:
 - a. Copper: Every floor not to exceed 10 feet.

2.12 DUCT SMOKE DETECTORS:

- A. Air-moving systems rated at 2000 CFM or greater shall be equipped with a duct smoke detector to automatically shut off the HVAC system if smoke is detected.
- B. The detectors shall be installed in the main supply duct between the connection to the air moving system and the first outlet .
- C. The detector shall be System Sensor Innovairflex D4120 4-wire Photoelectric Smoke Detector. Provide with Factory NEMA 4 enclosure if mounted outside.

2.13 DAMPER ACTUATOR

- A. Actuators shall be Belimo. Substitutions will not be acceptable. Actuator shall be direct coupled over the shaft, spring return type, unless specified otherwise

2.14 ELECTRICAL EQUIPMENT

- A. Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for motor control specified. Mount starter adjacent to equipment. See electrical drawing. Maintain minimum of 3 feet clearance to front of device.
- B. Motor Starters: Shall be NEMA I or III as appropriate, general purpose, weather-resistant, with watertight enclosure where required.

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2.15 INSULATION

- A. General: Insulation and lining material shall meet requirements of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM E84, NFPA 255 or UL 723 and shall conform to NFPA 90A and 90B.
- B. Heating and cooling supply and return duct and ERV ventilation supply air duct and related heating and cooling equipment insulation shall conform to 2019 Building Energy Efficiency Standards, Administrative Regulations, Title 24, Part I, Section 124, except to the extent that this Specification supersedes the minimum standards as established by the Code, in which case this Specification shall take precedent.
- C. Unless noted otherwise, insulation shall be Fiberglass, or approved equal material. Application Work shall be performed in accordance with the best accepted practice of the trade and the manufacturer's recommendations. The performance of insulation Work shall be by experienced insulation applicators. Insulation shall be installed after the specified tests have been applied to the piping and duct systems, and the systems have been inspected and approved. Fiberglass trade names and/or numbers have been used to establish a standard of quality.
- D. External Duct Insulation – Outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in an unconditioned crawlspace; or other unconditional spaces: Shall be applied to concealed heating and cooling, supply and return duct and ERV ventilation supply air duct except duct that is internally lined. Insulation on duct shall be Manville Microlite FSK duct insulation, minimum installed R value of 8.0 or greater, FSK aluminum foil reinforced with fiberglass, scrim laminated to UL rated Kraft, or approved equal. Adhere to duct surfaces with Foster's 85-62 or approved equal, adhesive applied in strips of 6-inch-wide on approximately 12-inch centers. Circumferential seams shall be butted together and sealed over joints with 3-inch-wide pressure sensitive foil vapor barrier tape. Longitudinal edges shall be lapped 2 inches and secured with outward clinching staple 6 inches o.c. then sealed with pressure sensitive foil vapor barrier tape. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression) minimum thickness at corners shall be 1-inch. Where ducts are over 24 inches in width, the duct wrap shall be additionally secured to the bottom of the rectangular ducts with mechanical fasteners spaced on 18-inch centers (maximum) to prevent sagging insulation.
- E. External Duct Insulation – All other locations not listed above: Shall be applied to concealed heating and cooling, supply and return duct and ERV ventilation supply air duct except duct that is internally lined. Insulation on duct shall be Manville Microlite FSK duct insulation, type 100, minimum installed R value of 6.0 or greater, FSK aluminum foil reinforced with fiberglass, scrim laminated to UL rated Kraft, or approved equal. Adhere to duct surfaces with Foster's 85-62 or

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approved equal, adhesive applied in strips of 6-inch-wide on approximately 12-inch centers. Circumferential seams shall be butted together and sealed over joints with 3-inch-wide pressure sensitive foil vapor barrier tape. Longitudinal edges shall be lapped 2 inches and secured with outward clinching staple 6 inches o.c. then sealed with pressure sensitive foil vapor barrier tape. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression) minimum thickness at corners shall be 1 inch. Where ducts are over 24 inches in width, the duct wrap shall be additionally secured to the bottom of the rectangular ducts with mechanical fasteners spaced on 18-inch centers (maximum) to prevent sagging insulation.

- F. Internal Duct Insulation: Outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in an unconditioned crawlspace; or other unconditional spaces, shall be applied to all heating and cooling supply and return duct and ERV ventilation supply air duct and plenums on roof or where shown on Drawings. Manufacturer shall be Manville Microlite, or approved equal. Duct Liner shall be Linacoustic R, 2-inch-thick, 1.5 pcf, with a "K" value of 2.2 inches for a total "R" installed value of 8 or greater. Insulation shall withstand velocities of up to 5,000 FPM and temperatures up to 250 deg F.
- G. Internal Duct Insulation – All other spaces not listed above: Shall be applied to all heating and cooling supply and return duct and ERV ventilation supply air duct and plenums where shown on Drawings. Manufacturer shall be Manville Microlite, or approved equal. Duct Liner shall be Linacoustic R, 1-1/2-inch-thick, 1.5 pcf, with a "K" value of 2.2 inches for a total "R" installed value of 6 or greater. Insulation shall withstand velocities of up to 5,000 FPM and temperatures up to 250 deg F.
- H. Portions of duct receiving Duct Liner shall be completed with transverse joints neatly butted with no gaps or interruptions. The duct liner shall be adhered to the sheet metal with 100 percent coverage of adhesive and exposed leading edges and transverse joints coated with adhesive. Adhesive shall be a water-based product. In addition, this shall be secured with mechanical fasteners which shall compress the liner sufficiently in place. The liner shall be cut to assure overlapped and compressed longitudinal corner joints. Application procedures shall comply with the recommendations of the Sheet Metal and Air Conditioning Contractor's National Association's Duct Liner Application Standard, Second Edition.
- I. External Duct Insulation Exposed to Weather: Shall be applied to heating and cooling supply and return ducts and plenums exposed to weather if not noted to be internally insulated. Insulation shall be Knauf Type ASJ, or approved equal, rigid board fiberglass, 3 lb per cubic foot minimum density, 2-inch minimum thickness, 8.0 minimum R value. The board shall be neatly cut and fitted to the surface with joints tightly butted together and against standing seams. The insulation shall be secured to the duct with adhesive and mechanical fasteners starting 3 inches from butt joints and 18 inches o.c. each direction. Vapor-barrier

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tape shall be then applied over joints, seams, breaks and any penetrations of the insulation vapor barrier jacket. A weather-barrier mastic compound reinforced with fabric or mesh shall be applied as a finish coat. Finish by painting with two coats of aluminum paint.

- J. Ducts: Ducts shall be constructed, installed, sealed and insulated in accordance with the 2019 CMC. The above paragraph(s) shall supersede if more stringent.

2.16 TEMPERATURE CONTROLS

- A. Temperature controls shall be furnished as indicated in schematic Drawing on Plans including room thermostats, relays and other necessary combustion, operating and safety controls.
- B. Wiring and Conduit:
 - 1. Control wiring and conduit shall be the responsibility of this section and be installed as follows:
 - a. In equipment rooms/attics: Conductors shall be run in conduit. Final connection to equipment shall be flexible conduit.
 - b. Concealed in building construction (wall/inaccessible ceilings): Conductors shall be run in conduit.
 - c. Roof mounted/exterior equipment yards: Conductors shall be in conduit. All flexible conduit shall be seal-tite with weatherproof connections. Equipment on grade and detached from the building a distance greater than 36 inches shall have underground control conduit routed to equipment.
 - d. Above accessible ceiling spaces: Control cable will be allowed to be installed without conduit in accessible areas above ceilings as follows:
 - 1) Cable is an approved type for the application.
 - 2) Cable is bundled/organized in management devices routed square with building lines (no diagonals) and kept clear of electrical devices (i.e., ballasts, transformers, etc.) that could cause interference.
 - 3) Conduit sleeves are provided between accessible ceiling spaces (i.e., across soffits, gypboard ceilings, etc.) as required to maintain future access to cable.
 - e. Cable routed in accessible ceiling spaces shall comply with EIA/TIA standards for communications cabling. Communication bus wire shall be W183C-2058Y Connect Air, yellow shielded cable.
- C. Electric wiring, conduit and other electric devices required to complete the installation of the temperature control systems shall comply with requirements as set forth in the Electrical Section of this Specification.

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- D. After completion of the installation, the Contractor shall adjust thermostats, motors and other equipment provided under this Contract. He shall place them in complete operating condition subject to approval of the Architect.
- E. The Control System herein specified shall be free from defects in workmanship and material under normal use and service. If, within 12 months from date of acceptance by the Architect, any of the equipment herein described is proved to be defective in workmanship or material, it will be adjusted, repaired or replaced free of charge by the Contractor.
- F. The final connections and supervision of control wiring and interlock wiring shall be the responsibility of this Contractor.
- G. The Contractor shall submit to the Architect for approval the required number of shop drawings of the entire control system before starting Work.
- H. Upon completion of the Work, the Contractor will provide diagrammatic layouts of the Automatic Control Systems specified herein. Layouts shall show control equipment and the function of each item shall be indicated.
- I. The temperature control system shall be installed by persons in the direct employment of the temperature controls manufacturer(s) exclusive contracting representative. The Mechanical Contractor shall not install the temperature controls unless pre-approved by the Mechanical Engineer.

2.17 REFRIGERANT PIPING

- A. Refrigerant piping shall be flushed clean with nitrogen and the ends capped prior to installation. Refrigerant piping shall be Type L copper with wrought copper fittings. Use 45 percent minimum silver brazing alloy with melting point higher than 1,100 deg F for making the joints.
- B. Insulate refrigerant suction line with 1-inch-thick Owens-Corning Fiberglass or Armstrong Armaflex foamed plastic flexible tubing insulation applied with No. 500 adhesive. Use multiple layers and miter insulation to cover joints and all other items as required to prevent condensation.
- C. VRF and Heat pump systems: Insulate all refrigerant lines with 1-inch-thick Owens-Corning Fiberglass or Armstrong Armaflex foamed plastic flexible tubing insulation applied with No. 500 adhesive. Use multiple layers and miter insulation to cover joints and all other items as required to prevent condensation.
- D. When piping and insulation are installed outside of building, insulation shall be aluminum jacketed. Jacketing shall be minimum 0.016-inch-thick, 3105 or 3003 alloy aluminum with moisture barrier and stucco embossed finish. Provide aluminum elbow covers at all pipe bends equivalent in construction to jacketing.

SECTION 230000 – HEATING, VENTILATION, AND AIR CONDITIONING

2.18 REFRIGERANT PIPING ACCESSORIES

- A. Stop valves shall be Henry Type 622, 500 psi pressure rating brass, soldered, packless diaphragm, globe shut-off pattern.
- B. Solenoid valves shall be Sporlan Type MA14, 450 psi rating, brass body.
- C. Filter dryer shall be Sporlan "Catch-All" with soldered connections.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section.

3.03 PREPARATION

- A. Holes in Concrete:
 - 1. Provide sleeves, accurately dimensioned and shaped to permit passage of items of this Section.
 - 2. Deliver such sleeves, with accurate setting drawings and setting information, to the trades providing the surfaces through which such items must penetrate, and in a timely manner to assure inclusion in the Work.
- B. Flashing:
 - 1. Where items of this Section penetrate the roof, outer walls, or waterproofing of any kind, provide under this Section base flashing and counterflashing required at such penetration.
 - 2. Provide on each pipe passing through the roof a 4 lb seamless lead flashing and counterflashing assembly.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Conceal piping, ductwork, and equipment in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect in time to avoid unnecessary Work. Do not cut or notch structural members without specific approval of the Architect.

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- B. Follow manufacturer's instructions on items not specifically covered in drawings and specifications. Report discrepancies to Architect for clarification before starting Work.

3.05 EQUIPMENT INTERFACE

- A. Provide required shut off valves, unions, and final connections of piping to the Work of this Section.
- B. For electrically operated equipment, verify the electrical characteristics actually available for the Work of this Section and provide equipment meeting those characteristics.

3.06 PAINTING

- A. Paint inside of air outlets and connecting plenums with one coat of black paint or provide all such items factory prepainted.
- B. For roof-mounted equipment, provide factory pre-finish on exposed surfaces.
- C. Touch-up scratches and abrasions to be invisible to the unaided eye from a distance of 5 feet.

3.07 INSTALLATION OF DUCTWORK

- A. Ductwork shall be delivered to the Project site with surfaces clean and free of loose dirt and rust. Special care shall be exercised by the Contractor to store the duct in a clean area to prevent the accumulation of dirt prior to installation. Fabricated or partially fabricated duct sections shall not be stored in open fields or on dirt areas surrounding the construction site. Paved areas may be used, if available, provided adequate protection is provided to prevent the accumulation of dirt on duct surfaces. If possible, the Contractor should arrange to deliver duct to the project site and store on the floor of the area in which it is to be installed.
- B. Before installation of ductwork, the Contractor shall inspect each section of duct and wipe internal surfaces clean. At the end of each Work period, or when ends of duct are left installed for future extension, the open ends shall be tightly closed off with a plastic sheet and taped securely to the open end of the duct.
- C. Construct and install sheet metal in accordance with latest SMACNA recommendations. Provide variations in duct size and additional duct fittings as required and approved by the Architect at no extra cost to the owner.
- D. The throat radius of bends shall be 1-1/2 times the width of the duct. Provide turning vanes in any mitered turn greater than 45 degrees.

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- E. Transition slopes shall be no less than one to five where space permits.
- F. Abrupt offsets in the duct system greater than 30 degrees will not be allowed.

3.08 TEMPERATURE CONTROL INSTALLATION

- A. Install wiring and tubing parallel to walls and floors and securely clipped to structure or mechanical system components. Group parallel runs for neat appearance.
- B. Install room thermostats and other control devices at 48 inches above finished floor unless a lower mounting height is required for access by handicapped.
- C. Install outside air sensor in a location where it is not directly affected by radiation from the sun or any heat generating device or by a conditioned air stream or any other location that would produce a false reading.
- D. Upon completion of the installation calibrate all equipment and adjust controls for proper operation.

3.09 REFRIGERANT SYSTEM CHARGING PROCEDURE

- A. Pressurize the system with refrigerant and hold for 24 hours with no drop in pressure; test joints and equipment for evidence of leaks after satisfactory pressure test.
- B. Provide 1/2-inch angle-type charging and purging valves adjacent to high and low side of the condensing unit to accomplish the procedure described hereinafter. Connect the vacuum pump to both the high and low side of the system. Do Work when ambient air temperature is above 60 deg F during the evacuation process.
- C. Operate the vacuum pump until the system is evacuated to 2.5 mm Hg absolute. Break the system vacuum with nitrogen or refrigerant.
- D. After the system has been evacuated to 2.5 mm Hg absolute, close the vacuum pump suction valve and stop the pump.
- E. Charge system to required capacity with specified refrigerant.

3.10 CONTROL DEVICE IDENTIFICATION LABELS

- A. Thermostats and Exhaust fan switches shall have labels mounted on or just above the control device labeled with the equipment being controlled. As an example, for an exhaust fan controlled by a switch the label would read "EXHAUST FAN # 1" or if a thermostat the label would read "AC-1".

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1. Labels shall be 2 inches x 1-inch x 1/8-inch thick Formica/plastic engraving stock beveled on both sides and with two 3/16-inch diameter holes near the top uppermost tag corners.
2. Labels shall be white with 3/8-inch-high red engraved letters.
3. Labels shall be attached to the equipment with adhesive.

3.11 WARRANTY

- A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or owner.

3.12 SHOP DRAWINGS

- A. The Contractor shall prepare shop drawings covering duct systems, equipment and Mechanical Room piping systems. The drawings shall be prepared in 3/8-inch scale and shall be submitted to the Architect for approval prior to any fabrication. In preparing the shop drawings, the Contractor shall coordinate the location of duct, piping and equipment with the Work of other trades.

3.13 MECHANICAL SYSTEM START-UP RESPONSIBILITY

- A. Start-up Mechanical Systems and perform any such Work as may be required to adjust the systems to meet the requirements of the Contract Documents. Air distribution balancing shall be performed in accordance with Article "MECHANICAL SYSTEMS BALANCING".
- B. Install new clean specified filters in equipment containing filters immediately prior to owner occupancy. Contractor to bear all costs for this work.

3.14 MECHANICAL SYSTEMS BALANCING

- A. Testing and air balancing shall be performed by an independent balancing company certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Testing and balancing shall be performed by a company other than the mechanical system installers/contractor. The name of the firm that the Contractor proposes to engage to perform this Work of balancing the system shall be submitted to the Engineer for approval prior to commencing the Work.
- B. Conduct tests in presence of Architect/Engineer.
- C. After Systems have been tested as outlined, air and water flow rates shall be balanced, and control devices adjusted. Balance and testing shall not begin until

SECTION 230000 – HEATING, VENTILATION, AND AIR CONDITIONING

systems have been completed and are in full working order. Upon completion of the balancing operation and prior to final acceptance of the systems, the balancing firm shall submit a report, with six copies, certifying to the proper performance of the system for approval by the Mechanical Engineer.

1. The following information shall be included in the Air Side Report:
 - a. Fan speeds.
 - b. Motor current readings and voltage readings.
 - c. Air quantities in CFM at supply, return, exhaust terminals, and outside air intakes, both at design value and actual measured value. Test and adjust each terminal to within +10 percent of design requirements.
 - d. Air velocities in FPM at supply, return, and exhaust terminals at design value and actual measured value.
 - e. Positive static pressure, negative and total pressures and total air quantities for each fan system.
 - f. Equipment nameplate data.

END OF SECTION

SECTION 230013

GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Documents:
1. The other Contract Documents complement the requirements of this Section.
 2. GENERAL REQUIREMENTS, Section 230013, GENERAL MECHANICAL REQUIREMENTS, and Section 019113, GENERAL COMMISSIONING REQUIREMENTS, apply to the Work of this Section.
 3. Where requirements of this Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.
- B. Codes and Regulations:
1. California Plumbing Code (CPC).
 2. California Mechanical Code (CMC).
 3. California Building Code (CBC).
 4. California Green Building Standard Code.
 5. National Fire Code (NFC).
 6. National Fire Protection Association (NFPA).
 7. Local Building Department.
 8. Local Fire Marshal.
 9. Office of the State Fire Marshall.
 10. California Energy Commission.
 11. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.
- C. Included: Work includes, but is not limited to the following:
1. Heating, Ventilating, Air Conditioning and System Balancing.
 2. Plumbing.
 3. Fire Protection.
 4. Carpentry and metal Work required for Work of this Section and not specifically shown under another Section. Openings in concrete or masonry construction shall be either core drilled or saw cut unless indicated otherwise on Drawings.
 5. Excavation and Backfill.
 6. Coordination Drawings.
- D. Related Work:
1. Section 017329, CUTTING AND PATCHING.

SECTION 230013 – GENERAL MECHANICAL REQUIREMENTS

2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

1.02 DEFINITIONS

- A. Furnish: Purchase and deliver to job site in new condition.
- B. Install: Receive and store at job site until required; place secure and connect; furnish required appurtenances.
- C. Provide: Furnish and install as defined above.
- D. Section: Refers to a Section of these Specifications.
- E. Standards: The issue in effect as of the date of the contract documents.

1.03 PROJECT RECORD DRAWINGS

- A. Comply with pertinent provisions of Architectural Sections (Division 01, GENERAL REQUIREMENTS).

1.04 SERVICE INTERRUPTIONS

- A. When Work of this Section requires temporary shutdown of existing systems for connections, the shutdown shall be made only during pre-arranged time agreeable to the Owner.

1.05 CORRELATION, INTERPRETATION, AND INTENT OF CONTRACT DOCUMENTS

- A. The Mechanical Drawings are, in general, made to scale and the Contractor may obtain approximate distances and dimensions by scaling the Plans. It is distinctly understood, however, that it is done entirely at the Contractor's responsibility. Refer to Architect's Plans and Specifications for construction details, which will affect the Work and equipment. Examine the Architectural, Civil, Structural, Mechanical, Electrical, Landscape, Irrigation, Data, Fire Protection and Plumbing Plans and Specifications to ensure that this work does not conflict with the above trades. Plumbing, Mechanical and Electrical Plans are diagrammatic and, therefore, do not necessarily represent the exact installation. However, pipe sizing for utility services and ductwork are calculated per their respective codes and Standard Engineering Practice and shall be installed as sized from point of origin to terminal point. It shall remain the Contractor's responsibility to submit Shop Drawings if he/she has any questions about the final arrangement. Nothing on these Plans or Specifications shall be construed to permit work not conforming to all applicable codes and regulations.

SECTION 230013 – GENERAL MECHANICAL REQUIREMENTS

PART 2 - PRODUCTS

2.01 ACCESS PANELS

- A. If not called for under other Sections, furnish Milcor, Elmdor, or Jay R. Smith access panels where shown on the Drawings or required for maintenance access to completed Work of this Section. Submit size, type, and location of proposed access panels not specifically shown, for review by Architect.
- B. Access panels shall be constructed of 16-gauge prime coated steel or stainless steel with screwdriver operated cam latch, concealed hinges, and fire rating equal to adjacent construction.
- C. Provide flush type doors with:
 - 1. Stainless steel finish for tiled surfaces.
 - 2. Prime coated finish for other surfaces.

2.02 FLASHING

- A. Provide watertight flashing at all openings through exterior walls and roof. Refer to Architectural Drawings.

2.03 BELT DRIVES

- A. All belts shall be "Vee" type, or approved equal. Sheaves shall be adjustable and shall be sized to drive fan at scheduled RPM when set at midpoint of adjustment range. All belt drive assemblies shall be rated at 150 percent of drive motor horsepower. OSHA approved belt guards shall be provided over all drive assemblies. The Contractor shall change any belts and drives as required to produce the specified CFM.

2.04 VIBRATION ISOLATION AND NOISE CONTROL

- A. All fans, heating and ventilating units, air conditioning units, blowers and similar equipment shall be securely mounted to and/or supported from the structure.
- B. Isolate all bare water piping from structural members or hangers with "Trisolators" or submitted and approved equal insulating sleeves. Install hangers on outside of insulated jacket on all insulated lines.

2.05 WEATHERPROOFING

- A. All equipment exposed to weather shall be protected by means of a suitable finish (i.e., paint). All fan cabinets, roof-mounted equipment, and ductwork shall be

SECTION 230013 – GENERAL MECHANICAL REQUIREMENTS

fabricated in such a manner to prevent leakage through seams and joints. Water rated, exterior hoods shall be provided over motors, belts, and other devices to insure against damage by water. At all locations where pipes and/or ducts penetrate exterior walls, or roofs, suitable rain tight flashing shall be provided.

2.06 PIPE WRAPPING

- A. All pipe, metal components, and joints buried in ground shall be primed and protected with 10-mil tape double wrapped or approved equal per IAPMO IS 13-2006. Before tape application, all bare pipe and fittings to be wrapped must be coated with pipe wrap primer. Stretch first layer of tape to conform to the surface while spirally half-lapping, apply a second layer, half-lapped and spiraled as the first layer with spirals perpendicular to first wrapping. In lieu of tape wrap, heat shrinkable 10-mil minimum thick polyethylene sleeve may be used.
- B. When applying tape, use only enough pull to cause the tape to properly conform to the irregular surfaces of the item. The proper amount of pull is reached when the tape surface is smooth without any wrinkles. Continue tape 4 inches above grade. End overlaps should point down. Tape shall be applied per manufacturer's installation instructions.

2.07 ELECTRIC MOTORS AND ELECTRICAL DEVICES

- A. All Electric motor current characteristics are as shown in equipment schedules on drawings and as specified hereinafter in this Specification. The Contractor shall refer to the Electrical Plans and shall confirm all motor voltage, amperage and phase characteristics before processing submittals or ordering equipment. If any equipment is installed different from the supplied electrical power, it is the contractor's responsibility to correct equipment to the required electrical characteristics.
- B. All electrical devices of a type normally listed by Underwriters Laboratories, Inc. (UL) shall bear UL label of approval.
- C. Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for motor control specified. Mount starter adjacent to equipment. See electrical drawing. Maintain minimum of 3' clearance to front of device.
- D. Motor Starters: Shall be NEMA I or III as appropriate, general purpose, weather-resistant, with watertight enclosure where required.

SECTION 230013 – GENERAL MECHANICAL REQUIREMENTS

PART 3 - EXECUTION

3.01 GENERAL EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install equipment to provide neat appearance, required manufacturer's access, and required space to allow replacement or maintenance. Provide bases, supports, anchor bolts, and other items required to install equipment. Installation shall be level and braced per CBC.
- B. Equipment shall operate quietly and without objectionable vibration. Excessive vibration, other than from specified equipment operating at optimum conditions, shall be the Contractor's responsibility and shall be eliminated as directed by Architect.

3.02 COORDINATION OF WORK

- A. Coordinate Work of this Section with Work of other Sections to avoid conflicts. If required, provide shop drawings and submit to Architect for approval.
- B. Insure that Work of other Sections is suitable to accommodate Work of this Section.

3.03 ADEQUACY OF FURRING

- A. Conceal piping and ductwork in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect prior to ordering materials and fabrication of components.

3.04 PROTECTION AND CLEANING

- A. Protect equipment from dirt, moisture, and mechanical damage during construction. Restore or replace damaged equipment to original condition.
- B. Keep interior of piping and ductwork free of foreign material during construction. Flush piping systems with test medium specified under Piping Tests before installing equipment and appurtenances or making final connections.

3.05 CLOSING-IN OF UNINSPECTED WORK

- A. Do not conceal or cover Work before tests and observations are completed. Uncover Work prematurely closed in and repair resulting damage to all Work, if requested by Architect, Engineer, or Project Inspector.

SECTION 230013 – GENERAL MECHANICAL REQUIREMENTS

3.06 DAMAGE

- A. Repair or replace items damaged by leaks or overflow from Work provided under this Section and for any damage to any part of the project site, for a period of 1 year after notice of completion date. This is in addition to and not a limitation of other rights the Owner may have against the contractor under the Contract Documents.

3.07 MECHANICAL SYSTEM TESTING

- A. Furnish all test pumps, gauges, and equipment. Test all safety controls and devices.
- B. For air tests, install a calibrated test pressure gauge in the piping system to observe any loss in pressure. Calibrate the test pressure gauge with a dead weight tester within 15 days before use and certify by initial and date on a sticker applied to the dial face. Maintain the required test pressure for the time indicated. Brush joints with a soapy water solution to check for leaks if the required pressure cannot be maintained.
- C. After any test, repair all leaks found as directed and re-test as necessary until the system is proven tight.
- D. Before applying test pressure to any piping systems, the Contractor shall be responsible for isolating all equipment e.g., control valves, regulators, relief devices, tanks and any other line accessories, which would otherwise be damaged by the test pressure.
 - 1. Soil, Waste, Vent, Roof, and Condensate Drainage:
 - a. Entire System: Tightly close all openings except the highest one. Fill to overflowing with water.
 - b. Sections of System: Tightly close all openings except the highest opening of the section under test. Fill section with water to test each section with a minimum 10-foot head of water except for the uppermost 10 feet of the system.
 - c. Allow to stand for 4 hours or longer, as required to complete the inspection.
 - 2. Domestic Water: Fill with water and test at 150 psig. Retain for 4 hours.
 - 3. Gas Piping: Air test to pressure equal to one-and-one-half times the design pressure, but in no case less than 50 psig. Retain for 24 hours.
 - 4. Refrigerant: Pressurize the system with nitrogen to 150 psig and hold for 24 hours with no drop in pressure; test joints and equipment for evidence of leaks after satisfactory pressure test.
 - 5. Compressed Air: Air test to pressure equal to one and one-half times the design pressure, but in no case less than 200 psig. Retain for 24 hours.

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- E. After all Systems have been tested as outlined, all flow rates shall be balanced, and all control devices adjusted. See Section 230000, HEATING, VENTILATION, AND AIR CONDITIONING.
- F. The equipment and installations shall be operated by the Contractor and he shall demonstrate that all Systems are performing according to the requirements of the Plans and Specifications and to the satisfaction of the Architect, Engineer and Owner.
- G. Acceptance Testing Requirements: For applicable acceptance tests see the energy compliance documentation. Acceptance testing shall be the responsibility of the mechanical contractor and shall be performed by an Acceptance Testing Technician who has been certified by a California Energy Commission approved Acceptance Test Technician Certification Provider Program. The Test and Balance Contractor can also be the Acceptance Testing Technician

3.08 CUTTING AND PATCHING

- A. The Contractor shall do all cutting and patching which may be required for the installation of the Work under this Division of the Specifications. Patching shall be of the same quality, materials and finish as, and shall match accurately, all surrounding construction. No cutting of the Structure shall be permitted without the approval of the Architect.
- B. Wherever concrete or paved surfaces are cut to provide for the installation under this Section, the Contractor shall restore the surfaces to their original condition. Subgrade materials, concrete, and paving materials, along with the placement of same, shall be in accordance with the respective Sections of this Specification as they apply to the installation of such material.

3.09 EXCAVATION AND BACKFILL (Buried Pipes Within the Building Walls and to 5 Feet from the Building)

- A. Dig trenches straight and true to line and grade; bottom shall be left smoothed of rock points. Pipe shall be supported for the entire length on undisturbed, original earth. The minimum trench width shall be 16 inches and all pipe shall be 2 feet below the finished grade, minimum, wherever conditions permit. Sewer pipes to be below grade as necessary to meet the slope and invert on the Drawing. Whenever substantial variations of pipe bury is indicated by field conditions, the proposed changes in depth of bury shall be submitted, in writing, to the Architect for approval.
- B. All piping shall be laid on a bed of clean dry sand not less than 6 inches thick. The space between the pipe and the sides of the trench shall be backfilled with clean dry sand to a point 6 inches above the crown of the pipe. Both sides of the pipe shall be filled at the same time.

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- C. The remainder of the trench shall be backfilled with native soil in lifts no greater than 12 inches and shall be mechanically compacted by tamping so to maintain a minimum relative dry density of 95 percent, determined by California Impact Test Method No. 216.
- D. All backfilling shall be brought flush with finished subgrade.
- E. Excess material shall be removed from the site. Trenches shall be backfilled immediately after approval.

3.10 EXCAVATION AND BACKFILL (Buried Pipes Beyond 5 Feet from the Building Walls)

- A. The Contractor shall excavate for the installation of underground plumbing piping, and shall perform all Work to accomplish required excavation. Should it be required to cut asphalt pavement, such pavement shall be sawed or cut, to a depth necessary to bring about a straight-line break parallel to sides of the trench, so as not to disturb the adjoining pavement. All Work during its progress and after its completion shall conform truly to lines and grades given by the Architect.
- B. The width of the trench shall not be less than 12 inches, no more than 24 inches greater than the outside diameter of the barrel of the pipe to be laid therein. Where sheeting is required, this width shall be increased by the thickness of the sheeting.
- C. Should the trench be excavated to a greater depth than that given by the Architect, the Contractor shall bring such excavation to the required grade with such material as the Architect may designate, notwithstanding that it may be necessary to bring such material from other localities or to purchase suitable material; and the trench shall be tamped, as directed by the Architect. The required work shall be at the Contractor's expense, with no additional time.
- D. The material excavated shall be deposited along the side of the trench in such a manner as to create the least inconvenience possible.
- E. Special care shall be taken to have all fire hydrants and gate valves on water mains kept accessible at all times. The Contractor shall not obstruct the gutter or any street or driveway, but shall use all proper means to provide for the free passage of surface water along the gutters into storm water inlets. He shall provide channels where necessary, suitable to the Architect.
- F. Wherever required, the side of the trench shall be sheeted and braced in strict accordance with the rules, orders, and regulations of the Division of Industrial Safety of the State of California. If water or quicksand is encountered, it may be necessary to sheet the trench solid with the type of sheeting suitable to the Architect.

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- G. The Contractor shall cooperate with the Architect and maintain access to all areas required by the Architect. The Contractor shall be liable for all damages suffered by the Architect resulting from the contractor's negligence or lack of cooperation.
- H. Excess earth from the trenches, after compacting, shall be removed and disposed of by the Contractor unless otherwise directed by the Architect.
- I. Where groundwater or soft, yielding or otherwise unsuitable material is encountered in the bottom of the trench, which in the opinion of the Architect is an unsuitable foundation for the pipe, such material shall be excavated from the full width of the trench to a depth satisfactory to the Architect. Said depth shall be a minimum of 6 inches. The resulting space shall be backfilled with imported bedding properly compacted to give adequate pipe support.
- J. All piping shall be laid on a bed of clean dry sand not less than 6 inches thick. The space between the pipe and the sides of the trench shall be backfilled with clean dry sand to a point 6 inches above the crown of the pipe and both sides of the pipe shall be filled at the same time.
- K. The remainder of the trench shall be backfilled with native soil in lifts no greater than 12 inches and shall be mechanically compacted by tamping so as to maintain a minimum relative dry density of 95 percent as determined by California Impact Test Method No. 216.
- L. Any asphalt pavement cut for the purpose of installing underground piping shall be replaced and shall conform in kind and quality to the type of pavement removed, but, in no case less than 12 inches of base rock be placed beneath the pavement. Where plant mix or asphalt concrete surfacing exists, pavement shall not be less than 3 inches in thickness unless otherwise authorized by the Architect.

3.11 INSTALLATION OF PIPING, DUCTWORK AND EQUIPMENT

- A. The installation of piping, ductwork, and equipment shall be made in such a manner to clear beams and obstructions. Do not cut into or reduce the size of plates or any load carrying members without approval of the Architect. Check Drawings and Work of others to prevent interference. Deviations of the Work determined by the Architect shall be installed by the Contractor without additional cost.
- B. Install piping and ductwork promptly, cap or plug open ends of pipe. No piping shall be permanently covered by construction before inspection and approval. Piping and ductwork shall be installed in accordance with best practice and recommendations of the manufacturer.
- C. Conceal piping and ductwork unless indicated otherwise. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Remove

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defective material from site. Install piping generally level, free of traps and unnecessary bends to conform with building requirements, and provide space for other work. Piping to be free of unusual noises. Avoid any possible galvanic action by isolating dissimilar metals with suitable Dielectric Insulating Fittings.

- D. Unless called for otherwise, hereinafter in this Specification or by specific detail on the Drawings, all water pipes in contact with structure and/or hangers shall be suitably isolated. In the case of uninsulated pipe, "Trisolators" or equal shall be used.
- E. Protect enameled or polished equipment from damage, tool marks, etc.

3.12 STERILIZATION OF PIPES

- A. After preliminary purging of the Systems, the entire domestic potable water system pertaining to Work under this Contract shall be chlorinated in accordance with American Water Works Association, State of California Health and Safety Code procedure for disinfecting water mains. A thorough flushing operation shall be run upon completion of sterilization. Contractor shall then arrange with local health authority for test on mains and water systems and provide three copies of test results to the Architect.

3.13 EQUIPMENT IDENTIFICATION TAGS

- A. Major pieces of equipment shall include, but are not limited to water heaters, air conditioners, unit heaters, supply and exhaust fans, and shall be tagged.
 - 1. Tags shall be 2 inches x 2 inches x 1/8-inch thick Formica/plastic engraving stock beveled on both sides and with two 3/16-inch diameter holes near the top uppermost tag corners.
 - 2. Tags shall be white with 3/8-inch-high red engraved letters.
 - 3. Tags shall be attached to the equipment with bolts, screws, or chains as per valves.
 - 4. Tags shall have the following information:
 - a. Equipment number and nomenclature corresponding to the information on the mechanical contract drawings.
 - b. Examples:

WH	EF	AC
1	2	3

3.14 SEISMIC BRACING

- A. It shall be required that pipes, ducts and conduits be supported and braced per the SMACNA "Seismic Restraints Manual Guidelines for Mechanical Systems," 2006 Edition.

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- B. When the SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems" does not specifically address the size of duct or pipe to be braced, the following shall apply:
 - 1. All ducts shall be braced and guyed to prevent lateral or horizontal swing to the satisfaction of the Architect, Engineer, and State Inspector.
 - 2. All pipes shall be braced and guyed to prevent lateral or horizontal swing to the satisfaction of the Architect, Engineer, and State Inspector. Absolutely, no "Plumber's Tape" shall be used anywhere on this project.

3.15 OPERATION AND INSTRUCTION

- A. The Contractor shall furnish competent Technicians to supervise start-up operations of equipment specified by the Architect or Engineer and to instruct Owner's operators. The Contractor shall furnish six complete sets of operating instructions and service manuals to the Architect.
- B. Instruction period shall be started after instruction books and service manuals have been submitted to and approved by the Architect and shall be at hours (regular and non-regular) arranged by the Architect.
- C. Service manuals shall include oiling, cleaning, and servicing data, compiled in clearly and easily understood form and in a durable binder. Data shall show all serial numbers of every piece of equipment and complete list of replacement parts.

3.16 WARRANTY

- A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or Owner.

END OF SECTION

SECTION 232516

VEHICLE TAILPIPE EXHAUST

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Provide all labor, materials, and equipment necessary to put in working operation a complete turnkey system to remove both diesel and automotive exhaust gases and particulate of operating vehicles within the confines of specified fire station(s). All necessary controls, motors, fittings, ductwork, blower(s), labor and all other equipment and materials specified shall be part of the work.
- B. Section Includes:
 - 1. Rail Material.
 - 2. Top Mounting Suspension.
 - 3. Support Legs.
 - 4. Hydraulic Brake System.
 - 5. Rail Splicing Joint.
 - 6. Middle Rail Duct Connection.
 - 7. Trolley Assembly.
 - 8. Regulator Assembly.
 - 9. Uncoupling Valve Assembly.
 - 10. Upper Flexible Hose.
 - 11. Lower Hose Assembly.
 - 12. Safety Disconnect Coupling.
 - 13. Collection Nozzle Assembly.
 - 14. Manual Fill Valve.
 - 15. Hose Saddle.
 - 16. Electrical Controllers.
 - 17. Air Moving Devices.
 - 18. Ductwork System.
- C. All items of equipment and materials described in these specifications are to be furnished, installed, and placed into proper operating condition in accordance with good practice and manufacturer's written or published instructions.

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1. The exhaust removal system shall provide virtually 100 percent complete evacuation of all diesel fumes at the source from start up to exit of the apparatus from the fire station. The diesel exhaust removal system shall be capable of delivering complete coverage for bays up to 110 feet in length. The system must be able to accommodate drive through and back-in bays to meet all the needs of the fire department.
2. The system shall not affect personnel boarding the apparatus. Hose loops shall not hang any lower than 6 feet from the bay floor. The hose assembly shall not come into contact with the vehicle other than one connection point to the vehicle's tailpipe. The hose assembly shall not touch or drag on the bay floor.
3. The exhaust system shall not block doorways, exits, and aisles in the apparatus bay, which could endanger the welfare of fire personnel or visitors.
4. To protect the apparatus electrical system from possible damage, the system bid shall not incorporate any type of electromagnetic device that requires the apparatus to be utilized as an electrical ground for systems operation.
5. The system must be designed and capable of capturing virtually 100% of the exhaust gas and particulate even in the event of a complete power failure. The system shall not detach itself from the apparatus for any reason during a power failure other than normal exiting of the apparatus bay. System shall discharge exhaust outside the station even in the event of a power failure.
6. The system shall under no circumstance allow exhaust leakage or bypass the nozzle.

1.03 QUALITY ASSURANCE

- A. Engage a factory-certified experienced installer to perform work of this Section who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.
- B. The manufacturer UL and CUL Certified and certified by ISO-9001, and the Air Movement and Control Association (AMCA) to ensure quality, consistency and reliability of products. Certification documents shall be provided and attached to the bid proposal.
- C. Engage a firm experienced in manufacturing similar to that indicated for this Project and with a record of successful in-service performance.
- D. Conduct conference at Project site. Review methods and procedures related to vehicle exhaust system installation.
 1. Review access requirements for equipment delivery.
 2. Review equipment storage and security requirements.
 3. Inspect condition of preparatory work performed by other trades.

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4. Review structural loading limitations.
5. Review that all components specified in this Section and related components specified in other Sections are accounted for.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling and Unloading: Deliver hoses with protective packaging. Store in original protective crating and covering and in a dry location.

1.05 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Verify dimensions installation areas by field measurements.

1.06 COORDINATION

- A. Coordinate layout and installation with other work, including light fixtures, fixed equipment and work stations, HVAC equipment, and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.

1.07 REFERENCES

- A. Air Movement & Control Association International, Inc. (AMCA):
 1. AMCA Standard 500-D-98, "Laboratory Methods of Testing Dampers for Rating."
- B. American Society for Testing and Materials International (ASTM):
 1. Stainless Steel:
 - a. ASTM A240/A240M-04ae1 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - b. Bright, Directional Polish: No. 4 finish.
 2. Aluminum:
 - a. ASTM B209/209M-04 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - b. Powder-Coated Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.
 3. Galvanized Steel:
 - a. ASTM A653/A653M-04a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

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1.08 BIDDER QUALIFICATION

- A. Bids will only be accepted from companies that have an established reputation in the field of manufacturing and installing Diesel Exhaust Removal Systems. The bidder must be established in the business of Diesel Exhaust Removal Systems for a minimum of no less than 8 years. Bidder shall show proof that their system has been field tested and proven by supplying a list of not less than 100 fire department references (seven within the state the municipality is located in) to include phone number and contact name. Plymovent mandates only factory certified installers are allowed to install Plymovent Systems at Fire Stations. Bids will only be accepted from companies that have a local (within 200 miles of the job site) inventory of spare parts (minimum value of \$10,000) and factory certified and trained service technicians to perform the required service maintenance and to ensure there is no interruption due to lack of locally stocked certified parts.

1.09 MANUFACTURER QUALIFICATIONS

- A. Bids shall only be accepted by bidders supplying equipment from manufacturers that have an established reputation in the business of manufacturing Automatic Emergency Response Vehicle Exhaust Removal Systems for a minimum of no less than 10 years. The manufacturer must be ISO-9001 certified, UL and CUL Certified, and certified by the Air Movement and Control Association (AMCA) to ensure quality, consistency and reliability of products. Certification documents shall be provided and attached to the bid proposal.
- B. Where the requirement calls for a packaged exhaust system to be provided, all items shall be the product of the manufacturer. The product offering must be a product that has been offered by that mfg. for a minimum period of 10 years. No prototypes or private label products by other manufacturers will be allowed. System bid shall have a life of service of no less than 10 years to establish proof of quality, longevity, and service.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. PlymoVent Corporation/Plymovent Industrial Ventilation Systems. 115 Melrich Road, Cranbury, New Jersey 08512, Phone: (609) 395-3500, Toll Free: (800) 644-0911, Fax: (609) 655-0569, Website: info@plymoventusa.com

2.02 RAIL MATERIAL

- A. One-piece continuous extruded aluminum rail in a minimum length of 19 feet (5,791.2 mm) in an effort to reduce the points of leakage due to seams or

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connections. The construction profile shall be of a round profile type, diameter of 6.5 inches (165.1 mm) with a rail thickness of 0.175-inch (4.5 mm). The bottom portion of the rail shall have a continuous slot to accept a rubber seal.

1. Rail Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M).
2. Aluminum Rail: Extruded as a one piece design unit to maximize the structural integrity of the rail and to minimize joints. Extruded into the rail profile shall be all necessary mounting guides, which will allow for support of the rail mounting hardware and airline support cable.
3. Mounting Channels: Provided continuously along both sides of the rail extrusion in order the proper positioning of all required mounting supports in accordance with codes. The rail shall allow the trolley/hose assembly to glide to the door threshold in a safe and effective manner. The extruded rail channel shall allow the whole rail to remain rigid and shall provide an area to attach bolts for splicing additional rails together for systems over 19 feet (5,791.2 mm) long. The overall extruded rail lengths shall be 19-foot (5,791.2 mm) standard.
4. Rail System: Equipped with a hydraulic braking system that limits travel of flex hose as the vehicle exits the building.
5. Hydraulic Brake: Incorporated into the end cap of the suction rail.

2.03 TOP MOUNTING SUSPENSION

- A. Designed to attach with two mounting cleats to the mounting slots that were extruded into the rail profile. The top suspension mount support shall be zinc plated bright finish and provided with two mounting cleats with four 5/16-inch (7.9 mm) by 3/4-inch (19 mm) hex head bolts to attach the mounting support to the rail.

2.04 SUPPORT LEGS

- A. Manufactured and provided by the supplier of primary exhaust removal system (Equipment Manufacturer).
 1. Support Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M).
 2. Supports: Standard in 19 feet lengths. A minimum of one support with appropriate bracing shall be provided for every 10 lineal feet (3 m) to 12 linear feet (3.7 m) of rail profile. The support legs shall consist of a square outer profile with dimensions no less than 2 inches (50.8 mm) OD by 0.1-inch (2.54 mm) with 0.4-inch (10 mm) fastening hardware provided. The vertical adjustable mounting foot shall be capable of attaching the leg assembly to a ceiling with a 30-degree pitch, complete with 3/8-inch (9.5 mm) hardware necessary for mounting the leg assembly to the top suspension mount. The support leg shall be equipped with round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 inches (508 mm), 30 inches (762 mm) and 72 inches (1,828.8 mm). The

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angle shall be completely adjustable to the leg support and mounted perpendicular and parallel to direction of the rail. The typical support angle shall be 45 degrees from the centerline of the factory provided support leg. The standard leg shall be capable of meeting a Seismic Zone 4 requirement. Vertical support and bracing shall be provided to safely secure the rail profile in accordance with building code and seismic standards which may apply. A minimum of one support with appropriate bracing shall be provided for every 10 lineal feet (3 m) to 12 linear feet (3.7 m) of rail profile.

2.05 HYDRAULIC BRAKE SYSTEM

- A. Incorporated into the end cap of the suction rail profile. The hydraulic brake system must incorporate a hydraulic shock capable of reducing the forward impact of 1 to 4 suction trolleys which may be installed now or in the future to the exhaust rail system. This hydraulic shock shall be secured to a steel end cap fabricated of 6.25-inch (158.8 mm) diameter steel tubing with a wall thickness of 0.156-inch (4 mm) welded to a 0.156-inch (4 mm) steel plate with formed 90 degree side rails for rigidity. The end cap shall have a removable circular end plate to facilitate an end feed duct connection and shall be a black powder coated finish. The hydraulic shock shall be capable of reducing to a full stop the trolleys in less than 4 inches (101.6 mm), without physical damage to either the rail profile or trolley that it is stopping.

2.06 RAIL SPLICING JOINT

- A. The splice joint shall be formed aluminum extrusion equal to the internal diameter of the suction rail profile. The splice shall have a wall thickness of no less than 0.190 inches (4.8 mm) in thickness and a length of no less than 8 inches (203.2 mm) from end to end. The rail splicing shall be safely secured by no less than 12-3/8-inch (314.3 mm) by 1-1/2-inch (38.1 mm) bolts, nuts, and lock washers. Each bolt shall pass through the exterior of the rail profile and splicing joint and be secured on the inside by a lock washer and nut. Self-tapping bolts or screws are not acceptable.

2.07 MIDDLE RAIL DUCT CONNECTION

- A. The rail duct connection shall be rectangular to an 8-inch diameter round transition fitting fabricated from 24 gauge galvanized steel (ASTM A653) with a double rubber U-style lip seal. The rectangular slot shall be 19 inches (482.6 mm) long by 1-3/4-inch (44.5 mm) high with a 3/8-inch (9.5 mm) external flange to slide into the rail profile.

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2.08 TROLLEY ASSEMBLY

- A. Gantry type trolley with sealed bearing loaded wheels designed to roll inside the internal rail profile flange. The trolley chassis shall be galvanized steel (ASTM A653) epoxy coated with a black finish. The chassis shall be fitted with a tapered cone.
 - 1. Rubber Sealing Lips: Vulcanized Teflon strip covering 1-1/2-inch (38.1 mm) of the bottom edge of the sealing lip, which shall minimize resistance between the cone and the rubber sealing lips. The exhaust cone transition shall be a tapered slot design, which shall fit inside the suction rail profile. The tapered slot shall be equal or exceed in area the diameter of exhaust ventilation hose to which it is attached.
 - 2. Trolley Assembly: Equipped with rubber impact bumpers at both the front and rear of the trolley chassis to eliminate metal-to-metal contact which could damage the trolley assembly. There shall be a system balancer assembly provided to aid in the delivery of the hose to the exit door.
 - 3. Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 lbs (31 kg). The balancer shall have a minimum diameter steel cable of 0.080-inch (2 mm) and have a safety link connection.

2.09 UNCOUPLING VALVE ASSEMBLY

- A. Activate the release of the pneumatic collection nozzle located on vehicle's exhaust pipe. It shall be a whisker type valve that shall provide a single direction action and affixed to a mounting bracket directly onto the trolley chassis. The valve shall be activated when the whisker switch comes in contact with a disconnect plate located on the side of the rail profile.
 - 1. Disconnect Plate: Provide activation of the uncoupling valve switch mounted on the suction trolley chassis.
 - 2. Disconnect Plate: Capable of being mounted anywhere along the outside of the rail in a manner that allows for easy adjustment. One disconnect-plate shall be provided for each trolley that is provided to allow for independent adjustment of exit speeds.

2.10 UPPER FLEXIBLE HOSE

- A. Flexible exhaust hose manufactured for the sole purpose of venting high temperature exhaust gases.
 - 1. Flexible Hose: Designed strictly for the harsh environment of rapid response and auto-release of a vehicle exhaust tailpipe.
 - 2. Hose: Range from 4-inch to 5-inch diameter with varying lengths depending on the system length required ranging from 20 feet to 43 feet without joining or splicing connections.

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3. Hose Material: High temperature double-ply fabric hose with silicone coated fiberglass inner layer and a silicone-coated Nomex outer layer with a minimum overlapping thickness of 2-7/16 inches. This construction of hose must be capable of operating at continuous temperatures of 600 deg F and intermittent temperatures of 700 deg F such as are experienced when pump checks are performed inside the station.
4. Wire Helix: Bound and protected in laminations of hose winding. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel.
5. Wear Strip: 9/16-inch (14.28 mm) wide and be provided as a safety yellow color. The bend radius of the high temperature hose shall be no less than 1.5 times the diameter of hose to ensure that hot gases are not restricted as they pass through the system. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard and/or shock hazard from being utilized as a grounded, grounding or current carrying conductor for electromagnet connections.

2.11 LOWER HOSE ASSEMBLY

- A. Rigid 4-inch (101.6 mm) to 5-inch (127 mm) diameter by 2-foot (609.6 mm) long section of yellow and black hose identical in appearance to the upper hose assembly.
 1. Lower Hose: Support the pneumatic connection nozzle and chrome reducing elbow in a rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. Lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled.

2.12 SAFETY DISCONNECT COUPLING

- A. Four-part segmented coupling with removable wear strips to protect the vehicle and disconnect from wear shall be incorporated in the design of the system.
 1. Coupling: Consist of two spun aluminum collars connected by a reusable-segmented coupling band. The release tension of this device shall be preset at 130 lbs and adjustable from 20 lbs to 206 lbs of separating force to accommodate varying exit speeds of vehicles.
 2. Reusable.

2.13 COLLECTION NOZZLE ASSEMBLY

- A. Collection Nozzle Assembly: Provide a substantially air tight seal around exhaust tail pipe when connected thus allowing for 100 percent source capture. The seal

SECTION 232516 – VEHICLE TAILPIPE EXHAUST

shall not allow for escape of life threatening exhaust gases, which may be present during the following conditions:

1. In the event vehicle's engine is accelerated above normal idle resulting in an exhaust velocity greater than 5,000 feet per minute (25.4 meters per second).
 2. In the event that the output velocity or CFM of the exhaust exceeds the manufacturers normal capture velocity or CFM of exhaust system.
- B. Nozzle: Automatically adjust its internal orifice to accept any tailpipe ranging from 1 inch through 6-inch (152.4 mm) diameter.
1. Nozzle Pressure: Not exceed 15 psi (10,546 kg/m²) when connected to the vehicle's tailpipe.
 2. Nozzle Construction: High temperature synthetic rubber vulcanized to a high temperature synthetic fabric. A NOMEX inner liner shall be provided for the primary temperature source at the tailpipe to act as a friction barrier. The chrome-reducing elbow that connects to the connection nozzle shall be fabricated using continuous welded construction.
 3. Angle of Transition: No less than or greater than 67 degrees from the centerline of the reducer.
 4. Chrome Reducer: Incorporate a primary expanded metal debris screen, which is permanently affixed by welded seams to the inside opening of exhaust fitting.

2.14 MANUAL FILL VALVE

1. Located 6 inches (152.4 mm) above safety release coupling approximately 4 feet (1,219.2 mm) from floor, sliding/push button type for manual or automatic release. In its design this valve shall incorporate in its design a handle which the operator may easily operate in a standing position. The attachment of the collection nozzle shall not position the operator's breathing zone closer than 36 inches (914.4 mm) from the exhaust tailpipe. The automatic release of the connection valve shall be no greater than 3 psi (2,109 kg/m²) shift pressure to activate the automatic nozzle deflation.
 - a. Primary Air Supply: Accomplished by means of a compression type fitting. The regulated air supply line to collection nozzle shall be designed to safely release from the upper hose at a pressure no greater than 80 lbs (362.8 kg).

2.15 COMPRESSED AIR FEATURES

- A. Airlines: 1/4-inch (6 mm) OD tubing capable of exposure of high temperature air stream inside the ventilation hose and duct.
1. Fed through the exterior of the hose through Teflon and brass grommets.
 2. Fed through the exterior of the duct through high temperature rubber grommets to protect against abrasion.

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3. Unless a fire station air compressor is to be utilized the bidder shall provide a quiet operating compressor to be located proximate to the vehicle bays. It shall also be located so that preventative maintenance can be performed quickly and effectively.
4. The operation of the compressor running inside station shall not generate sound decibels in excess of 50 dB. The compressor shall be equipped with a filter/dryer to ensure the conveyance of clean dry air to the pneumatic controls incorporated in the auto-release ventilation system.

2.16 HOSE SADDLE

- A. Fabricated of a rubber molded cushion specifically manufactured for the sole purpose of suspending high temperature exhaust ventilation hose in a rapid response and auto-release application. The design of the saddle shall smoothly transition the direction of the hose during its travel along the track. Securing clamps shall be provided including a link fastener, for the purpose of mounting it to the balancer safety link.

2.17 ELECTRICAL CONTROLLERS

- A. Controller: Built and supplied by a UL-recognized and listed exhaust system manufacturer. Controller shall carry the UL – CUL listing label as an “Enclosed Industrial Control Panel.” Individual components listed by UL – CUL shall not satisfy the above requirement. Manufacturer shall undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications to follow.
- B. Electrical Controllers: Bear a visible UL-listing label as proof of subscribership and shall be validated by UL www.ul.com/database/ as an “Enclosed Industrial Control Panel.” Certification documents shall accompany bid documents.
 1. Manufacturer Name: _____
 2. UL File No.: _____
 3. Electrical controller and manufacturer shall be recognized and listed by UL. Controller shall be manufactured in accordance with UL 508 for “Enclosed Industrial Control Panels.” The electrical controller shall include a Class 1 limited energy control circuit. Enclosures shall be NEMA 12 rated and UL-listed as Type 12. The electrical control components shall be provided and mounted in an electrical enclosure to restrict access to internal components of the controller by authorized personnel only.
- C. Controller Performance: Designed to sense the output pressure and temperature change inside the ductwork system, which is normally generated by any internal combustion engine designed to propel a motor vehicle. The operating logic shall be designed to complete this cycle. At any point in time when a collection device is connected to a motor vehicle's exhaust tailpipe, as the operator starts the

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vehicle, the controller shall automatically sense the engine's output pressure or temperature of the exhaust and in turn energize the electrical contractor which will supply power to the AMCA-certified spark resistant fan motor. Through the use of an adjustable timer the controller shall keep the contactors energized for up to 6 minutes in accordance with the stations response requirement. If the responding vehicle does not disconnect from the exhaust ventilation system in less than the designated setting, the temperature override switch shall override the time delay to ensure continuous system operation. This automated function will work for as long as the exhaust gas temperature is in excess of the setting on the heat sensor located in the ductwork system. This cycle shall not allow the electrical contractor, which energizes the exhaust fan, to short cycle or stop the fan while the system is connected to an operating vehicle.

- D. Motor Control Contactor: Allen Bradley Industrial Electrical Contactor 100C series. The contactor shall be UL – CUL listed as an approved component.
- E. Motor Control Overload Relay: Allen Bradley 193 ES series. Overload relay shall have an adjustable trip range to meet the proper full load amperage of the blower motor.
- F. Soft Touch Controls: Incorporated on the face or the access door of the controller by the use of an adhesive backed Lexan membrane type label to prevent water infiltration, which would void the NEMA 12R rating.
 - 1. Label: Provided and secured permanently to the exterior of the electrical controller. Include the name of the manufacturer, address, telephone number, user instructions and any warnings or cautions required by Underwriters Laboratories.
 - 2. Auto Start: This mode of operation shall be strictly for normal day-to-day use, as it would apply to receiving an emergency call and leaving the station. Any one or combination of the three devices listed below in Paragraph H shall activate the system. The system shall maintain itself in the Auto Start mode and always return there after the Stop sequence has been initiated. The controller shall not have a permanent off position due to the potential health hazards of diesel exhaust components.
 - 3. Stop: This mode of operation shall be a system override to shut down the system manually. Upon activating this mode of operation, the exhaust system blower shall shut down. After a period not to exceed 3 seconds the controller shall automatically return to the Auto Start ready mode. This shall be a safety feature to prevent a potential health hazard from carcinogenic diesel exhaust leakage from systems having an undesirable open nozzle.
 - 4. Hand Mode: This mode of operation shall be a system override to run the exhaust system blower continuously for the purpose of running the vehicles indoors for equipment checks during inclement weather. Upon activating this mode of operation, the exhaust system blower shall start and run continuously until the Stop mode is activated at which point the system will automatically return to the Auto Start ready mode within a maximum three second time period.

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- G. System Indicator LED's: Show system status at all times.
 - 1. Auto Start Indicator: Indicate the system is in the fully automatic mode of operation and that power is on to the controller.
 - 2. Fan On Indicator: Indicate that power is being applied to the system blower and the controller is operating normally.
 - 3. Filter Status Indicator: Indicate, if flashing, excessive pressure loss across the filter bank media. Consequently, the filter must be serviced to maintain optimum efficiency of the system.
 - 4. Stop Indicator: Indicate the fan has been manually de-energized and will return to the Auto Start ready sequence in less than 3 seconds to prevent the system blower from being left in the Off mode.
 - 5. Manual Run Indicator: Indicate the fan is operating in a continuous run mode until interrupted by the stop mode activation.

- H. Controller Transformer: UL-listed industrial control circuit transformer sized to properly supply all components so that only one transformer shall be required. Transformer shall be provided with multi-tap primary for 115, 208, 240, 277, 400, 480, and 600 VAC, and 24, 120, 230 VAC secondary operating on 50 or 60 hertz with a capacity of 90 volt amperes.

- I. Control Circuit Protection: By the use of primary and secondary fuses (NEC 430-72) to meet UL requirements. The primary shall be protected by a pair of FLQ style fuses rated at 1.6 amps for voltages under 400 V and a pair of 0.75 amp fuses for voltages over 400 V. The primary fuse holder shall have a standard indicator light feature to aid in troubleshooting blown fuses. A single glass fuse rated at 3 amps at 250 V shall protect the secondary side of the control circuit.

- J. Electronic Control Circuit Card: Solid state printed circuit board. The soft controls shall be an integral part of the control circuit card. The control circuit card shall utilize a potentiometer to adjust the length of the timing cycle from 7 to 360 seconds. It shall incorporate several different modes of operation and optional features.

- K. Activation Devices:
 - 1. Engine Start Switch: An engine pressure sensing type, capable of recognizing the output pressure of any type of motor vehicle exhaust. The electrical contact shall be dry type or not to exceed 24V AC. There shall be one sensor per vehicle.
 - 2. Thermal Start Switch: Temperature sensing switch of the snap disc type and adjustable from 90 deg F (32 deg C) to 130 deg F (55 deg C) to configure the system based on different exhaust temperatures. There shall be one sensor per vehicle.
 - 3. Remote Control Transmitter and Receiver: Shall be an optional feature with three independent channels of control. The receiver shall operate on 12 V to 24 V AC or DC. The handheld transmitter shall be molded out of a highly visible orange composite with a visor clip on the back making it rugged and easy to locate. It shall be powered by a 9 V battery for ease of replacement

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and cost savings. Utilizing three sets of normally open and normally closed contacts allows the device to be used to control three separate functions from up to 1/4-mile away.

- a. Channel A: Shall be capable of starting and stopping the exhaust system blower.
 - b. Channel B: Shall be capable of operating the apparatus bay door upon entering or leaving the fire station, if desired.
 - c. Channel C: Shall be capable of remotely controlling the traffic signal in front of the fire station, if so equipped.
- L. Clean Filter Indicator Alarm: Used in conjunction with the optional Unifilter for filtering diesel exhaust particulate before release to the atmosphere. The clean filter indicator shall monitor the pressure loss across the filter bank media. Once the useful life of the filter has been depleted the pressure differential switch will signal a high-pressure loss and flash the “Fan On” indicator while the exhaust blower is running
- M. Electrical Wiring: Run in wire channel to allow for easier identification of the wiring circuits and for a neat appearance. All wiring circuitry shall meet International Electrical Code and UL standards for proper size, bending radiuses (International Electrical Code) and terminations.
- N. Electrical Terminal Block: 600 V, UL-rated and recognized. It shall provide individual connection points for remote controls, clean filter indicator and power connections. The primary and secondary control wiring fuses shall be incorporated into the terminal block as one unit.
- O. Product Manual: Shall be provided with each electrical control box supplied. The product manual shall include a description of components with part numbers inclusive to the controller. It shall include a wiring schematic showing all internal circuitry as well as all field installed wiring connections to the controller.
- P. Electrical Interference: To protect the apparatus and communications, designs that allow any possibility of electrical back-feed or induced current which may interfere with a central services communication or onboard vehicle computer logic or navigational equipment will not be accepted.

2.18 ELECTRICAL SYSTEM

- A. Station Electric Supply Panel: The power circuit for the “Emergency Response Vehicle Exhaust Removal System” shall originate in a circuit breaker panel board of the appropriate size to handle the load. Fan circuit shall be supplied by a UL-listed, HACR-rated circuit breaker (HACR rating is specifically for motor type loads) of the same type as indicated by the manufacturer of the circuit breaker panel or a dual element time delay fuse for fuse style panels. The circuit shall be clearly marked on an engraved ledger plate or in ink on the panel schedule as “Emergency Response Vehicle Exhaust Removal System.”

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- B. OS-3 Automatic Controller: Built and supplied by a UL-recognized and listed exhaust system manufacturer. Controller shall carry the UL – CUL listing label as an “Enclosed Industrial Control Panel.” Individual components listed by UL shall not satisfy the above requirement. Manufacturer must undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications in Section 2.17, Electrical Controllers. The controller shall be mounted 6 feet (1.829 m) to the top of the cabinet AFF (above finished floor). A safety disconnecting means must be within sight of the controller for servicing and for safety reasons. If the supply panel is not within sight, a separate disconnecting means is required beside the controller (NEC 430-102(a)). Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. See attached Table 1-1 for proper Square D part number of safety disconnect switch.
- C. Power Wiring Conduit: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (International Electrical Code). Conduit shall be supported with a conduit strap every 10 feet (3 m) and within 3 feet (914.4 mm) of each box or termination, (International Electrical Code and local modifiers.).
- D. Power Wiring from Supply Panel to OS-3: THHN stranded copper wire consisting of a flame retardant, heat-resistant thermoplastic insulation with a nylon jacket for abrasion, gas, and oil resistance and rated up to 600 volts.
- E. Low Voltage Control Wiring: Minimum of a 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) to meet UL standards for the controller’s low voltage field wiring. Termination procedure shall be as follows; the shielded cable shall be stripped back inside the control cabinet, the mylar foil shield and silver drain wire are to be twisted together and secured under the screw in the grounding lug inside the control cabinet. Terminations at each sensor must leave foil shielding and drain wire intact and at no point shall it come into contact with ground. There shall be only one connection to ground.
- F. Low Voltage Control: Encased in a minimum of 1/2-inch (12.7 mm) EMT from the OS-3 Controller to the attic or building steel where it shall terminate with a EMT connector with a threaded plastic bushing.
- G. Conduit: Supported with a conduit strap every 10 feet (3,048 mm) and within 3 feet (914.4 mm) of each box or termination (International Electrical Code). The 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) shall be supported by the building structure and ran in a manner that the cable will not be damaged by normal building use (International Electrical Code and local modifiers.), securely fastening it with nylon tie wraps every 24 inches (609.6 mm) to 36 inches (914.4 mm). Draping of the cable perpendicular to building steel or support members will be unacceptable.

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- H. Power Wiring from OS-3 to Fan Motor: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (NEC 348-10). Conduit shall be supported with a conduit strap every 10 feet (3048 mm) and within 3 feet (914.4 mm) of each box or termination (International Electrical Code and local modifiers.). Conduit shall extend through the outside wall through a hole of the proper size and terminate directly into the back of the safety disconnect with the appropriate connector and sealed with a silicon sealer or cement mortar. (Using fan model number select appropriate wire and conduit size from Table 1-1.)
- I. Fan Safety Disconnect: Square D, non-fusible, NEMA 3R rated for wet locations, mounted adjacent to the AMCA Certified blower. Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. (Using fan model number select appropriate safety disconnect from attached Table 1-1.)
- J. Liquid Tight Flexible Metal Conduit: UL-listed liquid tight flexible metallic conduit (Sealtite). Conduit will encase the load wires and ground wire from the safety disconnect switch to the blower motor. Conduit length not to exceed 4 feet (1,219.2 mm) from disconnect to blower motor. The appropriate listed terminal fittings shall be used (NEC 351-7). (Using fan model select appropriate conduit size from attached Table 1-1.)
- K. Spark Resistant Blower: AMCA certified, designed and installed as a direct drive spark resistant blower (IMC 503.2), The motor shall meet current EPACT standards for energy savings. Fans utilizing steel impellers will not be accepted.
- L. Temperature Switch: One for each apparatus connected to the system. The temperature switch shall be of the snap disc type and adjustable from 90 deg F (32 deg C) to 130 deg F (54 deg C). It shall be mounted on the ductwork 2 inches (50.8 mm) above the pressure switch by drilling a 1-inch (25.4 mm) hole, sealing the switch with silicon sealant and securing with two tek screws. Electrical connection shall be made with terminals provided or solder less type such as Thomas & Betts Part No. 14RB-2577 or equivalent.
- M. Pressure Switch: One for each apparatus connected to the system. The pressure switch shall operate at a maximum of 24 VAC, pre-calibrated at 0.18 inches of water column. Mounting shall be accomplished by drilling a 3/8-inch (9.5 mm) hole 3 inches (76.2 mm) above the riser bracket and to the left of the regulator and threading the switch into the duct. The electrical connections shall be made with a 0.020-inch (0.5 mm) by 0.187-inch (4.8 mm) female quick disconnect terminals, such as Thomas & Betts Part No. 14RBD-18277 or equivalent.

2.19 AIR MOVING DEVICES

- A. Centrifugal Fans: Direct drive centrifugal type, high pressure, single width, single inlet as required or indicated.

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- B. Impeller Wheels: Radial design for high static pressure performance, spark resistance and made of Almag material to prevent static electricity build up. The impeller shall be dynamically and statically balanced and of the non-overloading type to provide maximum efficiency while achieving quiet, vibration-free operation. The fan housing shall be manufactured from a nonferrous material – Aluminum or epoxy coated galvanized steel (or) approved equivalent. The outlet configuration shall be top horizontal, bottom horizontal, or up-blast. The housing shall be capable of field reconfiguration in the event the mounting position needs to be changed for unforeseen reasons. For aesthetic reasons the fan motor and assembly shall be mounted on an epoxy coated galvanized steel (ASTM A240/A240M) mounting base to prevent rust stains on the exterior of the building. The fan housing and motor mounting hardware shall be 16 ga. galvanized sheet metal or Type 304 stainless steel (ASTM A240/A240M) for serviceability reasons. The base shall have four pre-punched openings at bottom of fan base for field attachment to either an exterior wall or roof mounting structure.
- C. Fan Motor and Bearing: All 1 hp (746 watts) to 15 hp (11,190 watts) motors shall be totally enclosed fan cooled (TEFC) continuous duty rated. The motors shall be dual voltage where applicable. Motors built after October 27, 1997 shall comply with the government mandated “Energy Policy and Conservation Act” (EPACT) as outlined by the Department of Energy. The bearings shall be self-aligned, ball bearing type permanently sealed and lubricated. The exhaust discharge outlet shall be in compliance with International Mechanical Code and ACGIH recommendations (minimum of 36 inches above roofline). Air intakes, windows, cascade systems, prevailing currents, communication equipment and building aesthetics shall be considered in the final location of the fan.
1. Teflon Shaft Seal: The fan shaft shall be steel and rotate in a non-sparking Teflon seal to prevent leakage and to prevent hot exhaust gases from coming into contact with the motor bearings.
 2. Variable Speed Drive: The motor shall be compatible with a variable speed drive unit.
- D. Performance: The delivered volume shall take into account all the static regain of vehicle engine exhaust (based on an airtight connection at the tailpipe), lengths of ductwork, elbows, branches, shut off, wyes, etc. which accumulate the static pressure at the field inlet. The manufacturer’s provided fan(s) shall be performance guaranteed.
1. Fan Capacity: The fan capacity shall be sized as such as to deliver the required CFM at each hose drop to which the vehicle is attached.
 - a. The 4-inch (101.6 mm) hose system shall be designed to deliver a minimum of 500 CFM (2.9 M/Second) at a velocity of 5,800 FPM (33.6 M/Second) at the hose and nozzle connection.
 - b. The 5-inch (127 mm) hose system shall be designed to deliver a minimum of 750 CFM (4.4 M/Second) at a velocity of 5,800 FPM (33.6 M/Second) at the hose and nozzle connection.

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- c. The 6-inch (152.4 mm) system shall be designed to deliver a minimum of 1,100 CFM (6.4 M/Second) at a velocity of 5,800 FPM (33.6 M/Second) at the hose and nozzle connection.
- E. Location: The preferable fan location shall be on the outside of the fire station as far away from any living quarters as possible so that firefighters would not be disturbed by the system activation. No blower fans shall be mounted inside the fire station. Silencers shall be provided when fan sound pressure level exceeds 64 dB.

2.20 DUCTWORK SYSTEM

- A. Ductwork Type and Materials: UMC Class 2 or SMACNA Class II product conveying duct, meet or exceed criteria for construction and performance as outlined in Round Industrial Duct Construction Standards, SMACNA. Materials of construction unless otherwise specified for all ductwork and fittings shall be a minimum G-90 galvanized sheet metal (ASTM A653/A653M). Only when specified, Type 304 stainless steel (ASTM A240/A240M) shall be provided.
- B. Ductwork Sizing and Gauges: Round pipe construction, with the range of available sizes not to exceed 10 inches (254 mm) in diameter. Duct gauge shall depend on diameter and a minimum operating pressure of 8 inches water gauge (1,990 Pa).
- C. Acceptable Gauge and Reinforcement Requirements: Inner duct diameter 4 inches (101.6 mm) through 11 inches (279.4 mm) diameter shall be 22 gauge standard pipe (International Mechanical Code).
- D. Ductwork Fittings: Round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected (International Mechanical Code).
- E. Air Duct Branch Entrances: Factory fabricated fittings or factory fabricated duct/tap assemblies.
- F. Fittings: Constructed so that air streams converge at angles no greater than 45 degrees (International Mechanical Code).
- G. All Seams: Continuous stitch welded and if necessary, internally sealed to ensure air tightness. Turning elbows shall be stitch-welded and used for all diameters and pressures. They shall be fabricated of 24 gauge galvanized steel and constructed as two-piece with continuous welded seam construction fittings similar to those provided by Lindab Inc.
- H. Tapered Body Fittings: Used wherever particular fallout is anticipated and where air flow is introduced to the transport duct manifold.

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- I. Ductwork Design Velocities: Minimum of 3,500 FPM (20.3 M/Second) to 4,000 FPM (23.2 M/Second) transport velocity.
- J. Capture Velocity: 5,500 FPM (31.9 M/Second) to 6,000 FPM (34.8 M/Second) to extract 100 percent of the exhaust gases.
- K. External Ductwork: Sized for the exact inlet and outlet of the exhaust fan blower. An exhaust rain cap shall be supplied and manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an integral part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.
- L. Exhaust Penetrations: The core drilling shall be properly sized to reduce the diameter of the opening to the smallest possible size.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide surface/substrate preparation as required by the manufacturer's printed installation instructions. Do not proceed with installation is in proper condition to receive vehicle exhaust installation.

3.03 INSTALLATION

- A. Install vehicle exhaust system in accord with manufacturer's written instructions, original design and referenced standards.

3.04 ADJUSTING

- A. Adjust vehicle exhaust system for proper operation. Replace any parts that prevent the system from operating properly.

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3.05 CLEANING

- A. Remove all debris caused by installation of the vehicle exhaust system. Clean all exposed surfaces to as fabricated condition and appearance.

3.06 PROTECTION

- A. Provide protection of the completed installation until completion of the project. Repair any damage at no additional cost to Owner.

3.07 DEMONSTRATION

- A. Provide the end user a minimum of 1 hour of hands-on demonstration and operation of the vehicle exhaust system and related equipment.

3.08 WARRANTY

- A. Provide a written warranty for a period of 1 year from date of shipment for all components.

3.09 TRAINING

- A. Provide training to fire department personnel in the daily use and maintenance of the vehicle exhaust removal system that has been installed and specified herein. The fire department shall be notified at least 7 days prior to the date scheduled for the training course. Training shall be for all personnel involved with the operation of the exhaust removal system to include all shifts required to man the particular facility. The Training session shall be performed in person by a recognized representative of the manufacturer of the exhaust removal system, in addition a training video shall be provided to the fire department.
- B. Provide training to all shifts during their normal shift period.

END OF SECTION

DIVISIONS 24 - 25
NOT USED

DIVISION 26
ELECTRICAL

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
1. Materials and equipment shall be furnished and installed in support of electrical work described in these plans and specifications including but not limited to, raceways, boxes, enclosures, feeders, branch circuiting, supports, terminal cabinets, sleeves, gutters, panels, transformers, switchgear, lighting fixtures, controls, relays, contactors, in order to complete and make fully functional the systems described.
 2. Lighting systems, both interior and exterior as shown on the plans and as specified herein, including controls, occupancy sensors, lumen sensors, photocell controls, lamps, dimmers, racks, dimming ballasts, supports, fasteners, straps, and miscellaneous mounting hardware and support structures for such equipment.
 3. HVAC and plumbing electrical: Conduit, conductors and terminations for all line voltage power, line voltage controls and fusible and/or non-fusible safety disconnect switches for HVAC equipment, including but not limited to air conditioners, furnaces, fans, heat pumps, cooling towers, system pumps, condensing units. Provide protective equipment unless otherwise noted, etc. including protective devices.
 4. Plumbing Electrical: Conduit, conductors, and terminations for plumbing equipment with power requirements including necessary fusible and/or non-fusible safety disconnect devices. Provide motor starters where required unless provided by mechanical specification.
 5. Power and Lighting Distribution: Furnish and install power and lighting distribution systems including but not limited to panels, feeders, transformers, branch circuits, devices, fixtures, disconnect switches, contactors, controls, etc. for a complete working system.
 6. Data systems infrastructure including all boxes, raceways, cable tray, wire basket tray, dedicated branch circuits, sleeves and penetrations, etc. as described and as shown in plans, risers, City of Long Beach

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

Telecommunication specifications, and/or required for a complete and operating system.

7. Lighting acceptance testing, documentation and completion of required forms as specified in Section 265670, LIGHTING ACCEPTANCE TESTING.
8. Allocation of time to adequately train the Owner on the use and operation of all systems installed within the facility or on the property. Minimum 2 weeks advance notice shall be coordinated with the Owner and his representatives. Training shall be as outlined in individual system specifications identified to follow.

B. Related Sections Under Other Divisions:

1. Mechanical Wiring: Control circuit wiring, energy management controls and interlocks for mechanical equipment shall be installed by Mechanical Contractor.
2. Painting of electrical equipment where exposed and required by the Architect to be painted as described elsewhere in the specification.
3. HVAC Control Raceway: Raceways, boxes, and control wiring for thermostats, temperature sensors and control components specified within the mechanical specifications, shall be furnished and installed as required by Division 23, HVAC, and installed in accordance with the minimum wiring methods allowed for branch circuit wiring in Division 26, Electrical, (the DDC systems/EMS systems and components are installed in accordance with Division 23, HVAC).
4. Smoke Fire Dampers: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
5. Duct mounted smoke detectors: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
6. Fire Station Alerting System: Shall be installed by Westnet under the General Contractor's contract. In addition, Contractor shall provide conduits, boxes, stubs to accessible ceilings, dedicated circuit(s) etc. as shown and/or required by the Westnet documents.

1.03 SYSTEM DESCRIPTION

- A. The electrical plans indicate the general layout and arrangement; the architectural drawings and field conditions shall determine exact locations. Field-verify all conditions and modify as required to satisfy design requirements as well as code minimums. Maintain all required working clearances as described in CEC Article 110 as well as other applicable articles.

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

- B. Discrepancies shall be brought immediately to the attention of the Architect for clarification. The Architect shall approve any changes. Prior to rough-in, refer to architectural plans that shall take precedence over electrical plans with respect to locations.
- C. Verify all power and communications utility company requirements prior to commencement of utility work. Make proper adjustments to the construction to satisfy the serving utility requirements if they differ from the construction documents. It shall be the Contractor's responsibility to contact each utility company for obtaining finalized utility design drawings and/or approval, and for scheduling inspection of utility infrastructure installations.
- D. Charges imposed by the electric and communications utility companies shall be paid by Owner directly to utility companies.

1.04 SUBMITTALS AND SHOP DRAWINGS

- A. Before construction, submit in (accordance with the General Conditions of this Specification) a complete list of all materials proposed to be furnished and installed under this Section. Any material procured without review and approval of the engineer and/or owner's representative will solely be at the contractor's risk.
- B. Manufacturers' specifications, catalog cuts and shop drawings as required to demonstrate compliance with the specifications. Identify specific intended use for each component where submittal may be ambiguous. Submit entire bound submittal at one time; partial submittals will not be accepted. At a minimum, submittals will be required for the following:
 - 1. Distribution equipment including panels and breakers, motor controls, distribution and branch circuit panels, grounding, transient voltage surge suppressors, etc.
 - 2. Electrical equipment including disconnects, fuses, raceways, straps and racks, fittings, conductors, boxes, gutters, devices, plates, etc.
 - 3. Lighting equipment including fixtures, ballasts, lamps, mounting accessories, color charts (where required), etc.
 - 4. Lighting control equipment including low voltage switching system, occupancy sensing equipment, etc.
 - 5. Constructability review letter/comments for lighting acceptance testing as required by Section 265670, LIGHTING ACCEPTANCE TESTING.
 - 6. Conduit including all fittings, etc.
 - 7. Wiring and cable, terminations, etc.
 - 8. Fire rating penetration materials, details, etc.
- C. The intent of these specifications is to establish a standard of quality for materials and equipment. Therefore, some items are identified by manufacturer or trade name designation. Substitutions shall be subject to the Architect's

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

approval. Samples of the proposed and substitute materials may be required for inspection prior to approval. Costs, if any, for evaluation of substitutions shall be the Contractor's responsibility. The decision of the Architect shall be final. Where the substitution will affect other trades, coordinate all changes with those trades concerned and pay any additional costs incurred by them as a result of this substitution. Approval of substitutions shall not relieve the Contractor from providing an operational system in accordance with all applicable codes and ordinances.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Storage of equipment for the job is the responsibility of the Electrical Contractor and shall be scheduled for delivery to the site, as the equipment is required. Damage to the equipment delivered to the site or in transport to the job shall be the responsibility of the Electrical Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall be new and bear the label of or be listed by a nationally recognized testing laboratory. The quality and suitability of all materials shall conform to the standards and practices of this trade.
- B. Supplied materials shall be of a current manufactured product line. Discontinued products are not acceptable. Where products are identified on the contract documents by part number, supply the current product model or series which meets the specification and intended use of the specified component.

2.02 SUPPORTING DEVICES

- A. Hangers: Kindorf B-905-2A Channel, H-119-D washer, C105 strap, 3/8-inch rod with ceiling flange.
- B. Concrete Inserts: Kindorf D-255, cast in concrete for support fasteners for loads up to 800 lbs.
- C. Pipe Straps: Two-hole galvanized or malleable iron.
- D. Luminaire Chain: Campbell Chain 75031, 90-lb test with steel hooks.

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PART 3 - EXECUTION

3.01 INSTALLATION

- A. Professionalism and appearance of installations shall be in accordance with accepted practices of this trade. Installation methods shall conform to manufacturers' specifications and recommendations. The Contractor shall man the job with qualified journeymen and helpers in this trade for the duration of the job. It is the Contractor's responsibility to communicate with and keep the job superintendent appraised of changes or clarifications, etc.
- B. Employment of any person on any job in the capacity of an electrician is not permitted unless such person has qualified for and holds a valid Journeyman Electrician Pocket Card or General Journeyman Electrician Certificate issued by the State of California Division of Apprenticeship Standards except, Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under the direct and constant personal supervision of a journeyman electrician holding a valid Pocket Card accepted by the State of California Division of Apprenticeship Standards.
 - 1. Each Pocket Card carrying journeyman electrician will be permitted to be responsible for the quality of workmanship for a maximum of one helper or apprentice during any same time period, provided the nature of work is such that good supervision can be maintained and the quality of workmanship is the best, as expected by Owner and implied by the latest edition of the National Electrical Code.
 - 2. Before each journeyman electrician commences work, deliver to Owner at the project site, a photocopy of the journeyman's valid Pocket Card.
- C. Materials shall be installed in accordance with the manufacturers' specification and recommendations. They must conform to the approval AHJ adopted codes and standards, but not less than the 2019 CEC and all applicable codes and standards, including but not necessarily limited to California Code of Regulations Title 24, NFPA, National Electrical Manufacturers Association, ANSI, CBC, and any other adopted ordinances of applicable agencies having jurisdiction. Refer to general conditions of specifications.
- D. Electrical Contractor shall lay work out in advance in order to avoid unnecessary cutting, chasing, and drilling of floors, walls, ceilings and other surfaces. Work of this nature shall be carefully done so as not to damage work already performed by other trades. Any damage which results must be properly repaired at no extra cost to the Owner. Such alterations shall not depreciate the integrity of the structure. Approval for cuts or penetrations in structural members shall be by the Architect.

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- E. Supporting Devices:
1. Verify mounting height of all luminaires or items prior to installation when heights are not detailed.
 2. Install vertical support members for equipment and luminaires, straight and parallel to building walls. Provide independent supports to structural member for electrical luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.
 3. Do not use other trade's fastening devices as supporting means for electrical equipment, materials, or luminaires. Do not use supports or fastening devices to support other than one particular item.
 4. Support conduits within 18 inches of outlets, boxes, panels, cabinets, and deflections. Maximum distance between supports not to exceed 8-foot spacing.
 5. Securely suspend all junction boxes, pull boxes, or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
 6. Provide seismic bracing per UBC requirements for this building location.
- F. Coordinate work with other trades as required to eliminate any delays during construction. Coordinate changes with other prime contractors to avoid construction conflicts.
- G. Engineer's Field Observation: Site visits during construction for field observations and reports will be conducted by electrical engineer when directed by the Architect. A list of items that need to be addressed will be submitted to the Architect for forwarding to the Contractor. A written response to all items shall be submitted for Owner's review once complete. When Electrical Engineering representative performs a field observation, the Electrical Contractor shall be present and available to remove equipment covers as needed.
- H. Drawings of Record: Provide a full and accurate set of field record drawings marked up in a neat and understandable manner submitted to the Owner Representative, Construction Manager, or Architect upon completion of the work and prior to issuance of a certificate of completion. The drawings shall dimension all electrical facilities including but not limited to underground conduit, vaults, boxes as well as conduit routing scaled to within 12 inches of actual field conditions and shall be kept up to date on a daily basis reflecting changes or deviations. Electrical facilities shall be accurately drawn on the plan to scale. Refer to the general conditions of these specifications for additional requirements. Record drawings shall be required to identify both horizontal and vertical dimensions to visible and fixed points such as concrete, asphalt, buildings, sidewalks, etc.
- I. Identification: Provide engraved laminated plastic nameplates for all switchboards, panelboards, fire alarm terminal cabinets, telephone and cable television backboards, main devices, control panels, time clocks, contactors

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and safety disconnect switches accurately identifying each device. Labels shall be attached to the equipment by means of screws or rivets. Self-adhering labels will not be acceptable. Refer to Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS.

- J. Safety: The Electrical Contractor is responsible to maintain equipment in a safe and responsible manner. Keep dead front equipment in place while equipment is energized. Conduct construction operations in a safe manner for employees as well as other work persons or anyone visiting the job site. Provide barriers, trench plates, flags, tape, etc. The Contractor shall hold all parties harmless of negligent safety practices that may cause injury to others on or near the job site.
- K. Guarantees: Equipment and labor shall be guaranteed and warranted free of defects, unless otherwise stated to be more restrictive, for a period of 1 year from the date of final acceptance by the Owner. A written warranty shall be presented to the Architect at the time of completion prior to final acceptance. Equipment deemed to be damaged, broken, or failed should be repaired or replaced at no additional cost to the Owner. Materials or system requiring longer than a 1-year warranty as described herein shall be separately warranted in separate letters of guarantee stating the duration of warranty.
- L. Operating and Installation Manuals: Provide two copies each of manuals, operating and installation instructions for equipment indicated in submittal packages. Instruct the Owner's representative as to the operation and location of equipment necessary to allow them to operate the facility upon final acceptance. This instruction period shall be prearranged with the Owner's representative prior to occupancy of the facility and the weeks prior to training scheduled.
- M. Lighting Acceptance Testing: Provide two copies of lighting acceptance testing results and equipment operating manuals as specified in Section 265670, LIGHTING ACCEPTANCE TESTING. Instruct the Owner on operation of control systems.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 1. Wires and cables.
 2. Connectors.
 3. Lugs and pads.
 4. MC cable only allowed above t-bar ceilings or accessible ceiling space for connection to light fixtures.

1.03 SYSTEM DESCRIPTION

- A. Provide wires, cables, connectors, lugs, strain reliefs, racking insulators for a complete and operational electrical system.

1.04 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Provide product data for the following equipment:
 1. Wires.
 2. Cables.
 3. Connectors.
 4. Lugs.
 5. Splice Kits.
 6. Strain Relief Fittings.
 7. Cable Racking and Insulators.

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- C. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of the CEC, latest adopted version with amendments by local Authority Having Jurisdiction (AHJ).
- B. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Wires and Cables: General Cable, Okonite, Southwire, or approved equal.
- B. Connectors: Burndy, Ilesco, Thomas & Betts, or approved equal.
- C. Wire connectors shall be minimum 75 deg C rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 volt, 105 deg C, with skirt to cover all portions of stripped wires. Connector shall be UL rated for number and size of conductors being joined together as a splice.
- D. Splices:
 - 1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
 - 2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
 - 3. Screw Terminal Lugs.
 - 4. Kearney Split Bolt.
- E. MC Cable: Alfex, AFC, or approved and shall meet all CEC Article 334 provisions.

2.02 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS. WIRE AND CABLE SHALL BE:

- A. Copper, 600 volt rated throughout. Conductors 14AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.
- B. Phase color to be consistent at all feeder terminations; A-B-C, top to bottom, left to right, front to back. Phasing tape shall be permitted on sizes #6 and larger.

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

C. Color Code Conductors as Follows:

<u>PHASE</u>	<u>208 Volt</u>
A	Black
B	Red
C	Blue
Neutral	White
Ground	Green

All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/THWN 600-volt insulation unless otherwise noted. Control, signal, communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.

- D. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
- E. MC Cable: High strength galvanized steel or aluminum flexible armor. Full length minimum size No. 12 copper ground wire, THHN 90C conductors, full length tape marker. Overall PVC or nylon cable tape. Short circuit throat insulators, mechanical compression termination.
- F. Manufacturers: Alfex, AFC sections for cable requirements.

2.03 CONNECTORS

- A. Copper Pads: Drilled and tapped for multiple conductor terminals.
- B. Lugs: Indent/compression type for use with stranded branch circuit or control conductors.
- C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 18 through 8AWG.

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

2.04 LUGS AND PADS

- A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 deg of bend are required; a pull box shall be furnished and installed for ease of installation. Said pull boxes must be sized and rated for the appropriate application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be provided for underground pull and splice boxes.
- B. Insulation: Use proper insulation types where temperature and environment are a factor.
- C. Splices at or below grade level shall be made with wet location rated and approved mechanical connectors and shall be encapsulated in epoxy or plastic molded poured kits. The connections must be assured to be watertight. Splices at or below grade shall always be avoided and minimized. Prior approval is required for feeder splices below grade. Submit proposed materials and exhibit showing location of intended splices for Engineer's review and approval prior to commencing with the work.
- D. Labeling: All conductors in panels, switchboards, terminal cabinets, vaults, pull boxes, and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent. In manholes and vaults, provide embossed brass tags identifying system serviced and function. See Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS.
- E. All conductors, wiring, cable, where installed below floor, slab, or underground shall be considered wet locations, and shall be rated accordingly. Non-waterproof cabling is not allowed in any below grade or wet application.

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- F. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.
- G. Cable and conductors routed through pull boxes and vaults shall be properly supported on porcelain or equal insulators mounted on steel rack inserts. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.
- H. Wires and Cables:
 - 1. Conductor Installation:
 - 2. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
 - 3. Install conductors with care to avoid damage to insulation.
 - 4. Do not apply greater tension on conductors than recommended by manufacturer during installation.
 - 5. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.
 - 6. Conductor Size and Quantity:
 - 7. Install no conductors smaller than 12AWG unless otherwise shown.
 - 8. Provide all required conductors for a fully operable system.
 - 9. Provide dedicated neutrals (one neutral conductor for each phase conductor) in the following single phase circuits:
 - 10. Dimmer controlled circuits.
 - 11. Isolated ground circuits.
 - 12. Ground fault and arc fault protected circuits where a GFI and arc fault breakers are used in panelboards.
 - 13. Other electronic equipment which produces a high level of harmonic distortion including but not limited to computers, printers, plotters, copy machines, fax machines, where indicated.
 - 14. MC Cable shall be allowed for lighting branch circuiting in non-exposed but accessible ceiling areas. Ceilings that are not accessible by definition shall not allow MC cable use. Power feeders, and electrical branch circuit wiring shall utilize raceways as specified and allowed by Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 - 15. Conductors in Cabinets:
 - 16. Cable and train all wires in panels and cabinets for power and control neatly and uniformly. Use plastic ties in panels and cabinets.
 - 17. Tie and bundle feeder conductors in wireways of panelboards.
 - 18. Hold conductors away from sharp metal edges.
 - 19. Connectors: Retighten mechanical type lugs and connectors for conductors to equipment prior to Notice of Completion.

**SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS
AND CABLES**

3.02 FIELD QUALITY CONTROL

A. Tests:

1. Test conductor insulation on feeders of 400 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below.
2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit report with operating and maintenance manual.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in California Electric Code (CEC) Article 250.
 - 2. The terms “connect” and “bond” are used interchangeably in this specification and have the same meaning.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be Underwriters Laboratory (UL) 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- B. Bonding conductors shall be American Society for Testing and Materials (ASTM) B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.02 GROUND RODS

- A. Copperclad steel, 5/8-inch diameter by 8 feet long, conforming to UL 467 unless otherwise noted on drawings and details.
- B. Quantity of rods shall be as required to obtain the specified ground resistance or additional rods shall be driven to obtain specified resistance or less.

2.03 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 - EXECUTION

3.01 GENERAL

- A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.
- B. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, fire sprinklers, plumbing piping, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.02 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3.03 SECONDARY EQUIPMENT AND CIRCUITS

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
- B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
 - 1. Provide a grounding electrode conductor sized per CEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
 - 2. Provide a supplemental ground electrode and bond to the grounding electrode system.
- C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- D. Conduit Systems:
 - 1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
 - 2. Non metallic conduit systems shall contain an equipment grounding conductor.
 - 3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.
- E. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power and lighting branch circuits.
- F. Boxes, Cabinets, Enclosures, and Panelboards:
 - 1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 - 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
 - 3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
- G. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.
- H. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.
- I. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

- J. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.
- K. Panelboard Bonding: The equipment grounding terminal buses of the normal and emergency branch circuit panelboards shall be bonded together with an insulated continuous copper conductor not less than No. 8 AWG where panels are in same room together or within 25 feet of each other. These conductors shall be installed in rigid metal conduit.

3.04 CONDUCTIVE PIPING

- A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.05 TELECOMMUNICATIONS SYSTEM

- A. Bond telecommunications system grounding equipment to the electrical grounding electrode system.

3.06 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 25 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the City. Final tests shall assure that this requirement is met and test results shall be submitted to the City with final close out documents.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in Institute of Electrical and Electronics Engineers (IEEE) Standard 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Below-grade connections shall be visually inspected by the Inspectors of Record (IOR) prior to backfilling. The Contractor shall notify the IOR 24 hours before the connections are ready for inspection.

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- D. Furnish a copy of tests to City at completion of project.

3.07 GROUND ROD INSTALLATION

- A. Drive each rod vertically in the earth, not less than 7-1/2 feet in depth.
- B. Where permanently concealed ground connections are required, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.
- C. Where rock prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. SUMMARY
- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Section 260548, VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS, for products and installation requirements necessary for compliance with seismic criteria.

1.02 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.

1.06 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.07 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.08 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200, ROOF ACCESSORIES.

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- C. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.
- D. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- E. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

capacities appropriate for supported loads and building materials in which used.

- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000, METAL FABRICATIONS, for steel shapes and plates.

PART 3 - EXECUTION

2.03 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4-inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

2.04 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

2.05 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000, METAL FABRICATIONS, for site-fabricated metal supports.

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- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

2.06 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000, CAST-IN-PLACE CONCRETE.
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

2.07 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

1.02 Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.03 SUMMARY

A. Section Includes:

1. Conduit and fittings.
2. Outlet boxes.
3. Weatherproof outlet boxes.
4. Junction and pull boxes.
5. Floor boxes and poke-through.
6. Cabinets, termination cabinets.
7. Gutters.
8. Concrete boxes and vaults.
9. Hazardous location: Sealing fitting (generator room).

B. Related Work:

1. Installation of all wire, cable, conductor, boxes/gutters, pull ropes, fiber optic cable raceway, conduit, innerduct, cable sleeve and duct as described on the plans and/or as specified here-in. This scope shall include pathways to be installed underground on-site and off-site, underslab, above grade, both concealed and exposed, overhead concealed and exposed as appropriately applied. Raceways/boxes shall be installed in accordance with their intended and allowed uses and as specified here-in whichever is more restrictive. Size and capacity of all raceway/boxes shall be as specified here-in or as depicted on the drawings but shall not be less than that required by code. Larger raceway sizes may be specified than code would permit. The specifications shall govern.
2. Listed products for termination, coupling, extending, benching supports of raceways shall be used.
3. Raceways/boxes described by this section shall include, but not be limited to, power for site utilities and lighting, site and building communications, controls, fire alarm, security, access control, sound systems, data system, energy management systems, power distribution, lighting, lighting

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controls, video, CATV, voice communications, intercom, nurse call, HVAC and other building low voltage/communications systems controls as may be required. Raceways, boxes and duct paths required for utility companies shall be installed per plans unless utility company requirements are more restrictive at which time those requirements shall take precedence.

4. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.
5. Pathways are shown in a diagrammatic way and are generally accurate as to routing, however, it is the Contractor's responsibility as a means and methods process to coordinate with all other trades that require space within a building. The Contractor shall obtain approval for installation of raceways routing through structural footings, retaining walls, columns, beams, purlins, grade beams, etc.
6. It is the Contractor's responsibility to insure that all raceway and boxes systems penetrate fire assemblies and sound rated assemblies in an approved manner using the appropriate and listed products for the purpose.
7. Trenching and backfilling for all underground conduit systems installed by the Electrical Contractor shall be the responsibility of the Contractor. Conduits shall have minimum cover requirement of 36 inches below finish grade with the exception of site lighting conduits which may be 24 inches below finish grade minimum. More stringent depth requirements may be imposed by the local agency and utility company and shall be adhered to, and / or this specification or as detailed on the plans. Joint trenching may be utilized where practicable and where permitted by this specification. Concrete, native material and sand shall be used as backfill material and shall be compacted in accordance with and coordinated with the grading and site preparation requirements. Conduits shall rest in a minimum of 4 inches bed of sand prior to backfill and compaction. Locations of existing underground (UG) utility systems shall be determined by calling Underground Service Alert (USA) at least 48 hours prior to any excavation.
8. Minimum conduit size shall be 1/2-inch except if plan shows or code requires larger size. Exception: Use minimum 3/4-inch for underslab and below grade applications outside of building exterior walls.
9. All electrical, control, communications systems shall be installed in Metallic conduit system. This shall include but not be limited to all systems described in Section B.3 above, except for voice and data systems which shall be installed as described on these plans.
10. All line voltage wiring within the building shall be installed in metallic conduit.
11. All conduit, concrete pads, underground concrete or fiberglass substructures shall be furnished and installed with the approved materials

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and type for the application. Provide proper traffic control during construction as well as barriers and protection of all excavations and trenching.

12. Empty or future conduits shall be properly plugged with plastic caps or inserts with a 3/8-inch polyethylene pull rope. Plastic or "duct" tape will not be acceptable.
13. Exterior installations: After conductors are installed, seal conduit ends to prevent entrance of foreign material using pliable duct seal, caps or waterproof expanding foam.
14. All low voltage systems including intercom, fire alarm, public address, etc. shall be in dedicated conduit systems. It shall be the contractor's responsibility to provide raceway down walls to outlet boxes and to provide sleeves across inaccessible ceiling spaces.
15. Underground conduits entering building shall have the open end of conduit within building above the elevation of the conduit outside the building such that water cannot enter building through conduit. If such a condition exists, a pull box outside of building footprint shall be installed in conduit route before conduit enters building whereby top of pull box is below finish floor of building and moisture may exit box before entering building.
16. No single conduit run of any type shall exceed 300 degrees of radius bend from termination box to termination box.
17. Separate Raceway System: Provide a separate dedicated raceway system for each system installed, do not combine different systems into a raceway or cable tray system, unless otherwise noted or allowed.
18. Spare, Future Conduits: Conduits labeled conduit only, spare, or for future use, shall be provided with a pull-rope, capped at each end, labeled as spare with destination marked, and turned over to the Owner in an unused state. Contractor shall not utilize these conduits for the installation of cabling or conductors as part of this scope of work. Contractor to verify and install at no additional cost to the Owner additional conduits as required for the installation of the systems being installed.
19. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Including but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, covers and all other necessary components.
20. Code Compliance: Comply with CEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to CEC 312, 314 and 366 except as noted otherwise.
21. Outlets to be flush mounted: Maintain integrity of insulation and vapor barrier. Unless otherwise noted, flush mount all outlet boxes.
22. Provide putty pads of proper type around outlet boxes and/or as detailed on plan to meet sound transmission restrictions and fire ratings of walls.

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1.04 SUBMITTALS

- A. Provide Shop Drawings and Product Data for the Following Equipment:
 - 1. Conduit and fittings.
 - 2. Outlet boxes.
 - 3. Weatherproof outlet boxes.
 - 4. Junction and pull boxes.
 - 5. Floor boxes and poke-through.
 - 6. Cabinets, termination cabinets.
 - 7. Gutters.
 - 8. Concrete boxes and vaults.
 - 9. Putty pads.
 - 10. Raceways
 - 11. Hazardous location: Sealing fitting.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.
- B. Furnish products listed by UL or other independent and nationally recognized testing firm.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Heavy wall Rigid Non-Metallic Conduit, shall be PVC schedule 40 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- B. Extra heavy wall non-metallic conduit, shall be PVC schedule 80 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- C. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
- D. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
- E. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of UL 1653, in accordance with CEC Article 362, and meet requirements of BI

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National Standard CAN/CSA-C22.2 No. 227.1-UL 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet UL and ICC building codes.

- F. Flexible Metal Conduit (FMC) shall be continuous wound reduced wall galvanized steel produced to UL standards.
- G. Liquid tight flexible metal conduit shall have a thermoplastic cover over a galvanized steel core containing an integral copper ground in sizes to 1-1/4-inch and shall be in compliance with UL standards and CEC Article 350.
- H. Surface mount raceway shall only be used where shown on the plans. The raceway and cover shall be "white" colored by Wiremold but be capable of being over-painted in the field if required. The raceway and fittings shall meet all requirements of CEC Article 386 and be UL listed. Raceway shall be mechanically connected to structure with backing and anchor bolts.
- I. Cable runway tray shall be 12 inches wide with 4-inch side rails unless otherwise noted. It shall be UL listed and use listed connectors, elbows, tees, etc. Material shall be hollow steel with gray painted finish.
- J. Manufacturers:
 - 1. Outlet Boxes: Bowers, Raco, Steel City or equal.
 - 2. Weatherproof Outlet Boxes: Bell, Red Dot, (Carlon) or equal.
 - 3. Floor Boxes: Wiremold/Walker, Hubbell, Steel City, or equal.
 - 4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
 - 5. Box Extension Adapter: Bell, Red Dot, (Carlon) or equal.
 - 6. Conduit Fittings: O-Z Gedney, Thomas & Betts, or equal.
 - 7. Vaults: Christy, Brooks, Utility Vault or equal.
 - 8. Putty pads: 3M, Hilti, or equal.
 - 9. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
 - 10. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
 - 11. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
 - 12. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
 - 13. Flexible Metal Conduit (FMC), Alflec, American Flexible Conduit or equal.
 - 14. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liquatite or equal.

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15. Surface mount raceway, Wiremold, Three Compartment Series 5500 or equal
16. Wire basket tray, B-line, GS Metals, Cablofil or equal.
17. Cable runway tray, B-line, CPI, Homaco or equal.
18. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
19. Floor Boxes, Poke-Thru, Hubbell PT7 Series, Walker/Wiremold RC4 Series, or approved equal unless otherwise noted.
20. Floor Boxes, Poke-Thru, Furniture Feed, Walker/Wiremold RC9 Series or approved equal.
21. Exterior In-Grade Boxes for Non-Utility Company, Precast concrete or polymer concrete, Utility Vault and Christy.
22. Hazardous Location: Sealing Fitting – Killark, Crouse-Hinds or Appleton.

2.02 OUTLET BOXES

- A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.
- B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as “MYERS” gasketed type hub or equal.
- C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4-inch square, minimum 1-1/2-inch deep. Single or 2 gang flush device plaster ring. Raco Series 681 and 686 or equal.
- D. Luminaire Outlet: minimum 4-inch square with correct plaster ring depth, minimum 1 1/2-inch deep with 3/8-inch luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.
- E. Multiple Devices: Three or more devices at common location. Install 1 piece gang boxes with 1 piece device plastering. Install one device per gang unless otherwise allowed.
- F. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

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- G. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.03 WEATHERPROOF OUTLET BOXES

- A. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner. Weatherproof boxes in wet locations as described in CEC 406.8(B) shall be provided with a “while-in-use” cover; red dot ‘CK’ Series of aluminum die-cast construction, NEMA 3R, with lacquer finish.

2.04 JUNCTION AND PULL BOXES

- A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type, shape, and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- B. Location:
 - 1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
 - 2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
 - 3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24 inches shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
 - 4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.05 BOX EXTENSION ADAPTER

- A. Construction: Diecast aluminum.
- B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

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2.06 CONDUIT FITTINGS

- A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.
- B. Steel boxes may allow for field knock-out modifications but shall in all other ways conform to code requirements.
- C. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water-resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

2.07 EXTERIOR IN-GRADE BOXES FOR NON-UTILITY COMPANY USE SHALL BE:

- A. Precast concrete or polymer concrete type with full bottoms and draining into gravel drywell. . Open bottom splice/pull boxes 24 inches x 36 inches and smaller shall be open bottom, with minimum 12 inches of gravel below for drainage.
- B. Flushmount in hardscape and 1-inch above grade in softscape.
- C. Provided with correct traffic type lid, i.e., full vehicular, intermediate incidental vehicular or pedestrian-rated as applicable stamped with "ELECTRIC," "LIGHTING," COMMUNICATIONS," etc. cover identification as shown on the drawings or as applicable. All boxes or vaults located in streets, driveways, sidewalks wider than 8 feet, and turf areas where mowing takes place shall be traffic rated.
- D. Provided with brass hold-down bolts in cover.
- E. Provided with necessary box extensions to gain proper depth.
- F. Seal all conduit in underground boxes with duct seal after conductors have been installed.

2.08 HAZARDOUS LOCATION SEALING FITTING

- A. Copper free aluminum gas seal fitting to prevent passage of gases and vapor through electrical conduit.

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- B. Provide proper sealing fitting listed for the hazard classification and orientation of installation.
- C. Include a drain canal and drain plug in installations which have a probability that liquid or vapor condensation may be trapped in raceway.
- D. Splices are not allowed in sealing fitting.
- E. Install packing fiber and sealing compound per manufacturers' recommendations.

2.09 PUTTY PADS

- A. Intumescent moldable firestop putty designed to protect electrical outlet boxes.
- B. Designed to install around outside of outlet boxes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as Educational, Health Care, wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and/or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without the permission and approval of the Architect. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roofmount conduits, where allowed, with minimum 12-inch-wide redwood blocks set in mastic unless otherwise detailed in roof requirements or as specified in roofing specification, by the Architect. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8 feet above finished grade shall be strapped at a minimum of 5 feet spacing.
- B. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material.

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Minimum 4 inches of bedding and cover of backfill material 1/4-inch size grain and smaller maximum. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints. All non-metallic conduit runs over 150 feet in length and over 1-1/4-inch trade size conduit shall utilize galvanized rigid steel elbows.

- C. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8 feet above finished grade to 18 inches below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8 feet above grade at 5-foot intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.
- D. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One-hole conduit straps are permitted from 1/2-inch to 1-inch and two-hole conduit straps are required for size 1-1/4-inch and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.
- E. Flexible conduit may be used where concealed in building construction or above dropped ceilings but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 30 feet of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquid-tight type. Fittings shall be manufactured for use with liquid-tight flexible conduit. All motor connections shall be made with liquid-tight flex. Flexible conduit may not be used where exposed except for last 2 feet of

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equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24 inches nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6 feet of flexible metal conduit extending from junction box to fixture. "Master" and "Slave" fixtures are permitted to use manufactured flexible cable of longer dimension up to 12 feet between "Master" and "Slave" only and only as a UL listed system component.

- F. Underground conduits and transition to above grade/slab shall be as follows:
1. PVC elbows allowed if top of elbow is minimum 18 inches BFG or below top of slab, otherwise GRS elbows are required.
 2. GRS elbows are required if conduit run is 150 feet or greater.
 3. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
 4. GRS elbows/risers to be PVC coated or 10 MIL taped wrapped (1/2-inch lapped) to 3 inches above finish grade or top of slab.
- G. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1-inch conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.
- H. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.
- I. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec," "Tel," etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).
- J. Conduit Seals: Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3 inches into conduit.
 2. Fill 3 inches of conduit with 3M #2123 sealing compound.

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3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
 4. Use conduit sealing bushings type CSB (O-Z/Gedney) or equal.
 5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
 6. Provide cable drip loop minimum 12 inches high.
- K. Marker tape: Place plastic yellow-marker tape at 12 inches below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.
- L. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12 inches of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6-inch minimum crossing distances are allowed, however 18 inches on all sides of a utility crossing must be concrete encased.
- M. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.
- N. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.
- O. Expansion Joints
1. Conduits 3 inches and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
 2. Provide conduits smaller than 3 inches with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5-inch vertical drop midway between the end. All conduit shall have a copper green grounding bonding conductor installed.
- P. Seismic Joints
1. At seismic joints, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes or approved fittings, on both sides of the joint. Connect conduits to junction boxes with sufficient slack flexible conduit such that these slack conduits

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are 1 1/2 times the distance between conduit ends. Flexible conduit shall have a copper green ground bonding jumper installed.

- Q. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- R. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- S. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.
- T. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.
- U. Mount outlet boxes, unless otherwise required by ADA, or noted on drawings, the following distances above the finished floor:
 - 1. Receptacles, Telephone, TV and Data outlets. (measured to bottom of outlet box): +15 inches.
 - 2. Outlet above counter (measured to top of outlet box): +46 inches.
 - 3. Control (light) Switches. (measured to top of outlet box): +48 inches.
 - 4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48 inches.
 - 5. Fire Alarm Visuals: the lower of +80 inches to bottom of lens, or 6 inches below ceiling.
 - 6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.
- V. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.
- W. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.
- X. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION

SECTION 260546.13

ELECTRIC UTILITY SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
1. Manholes, handholes, and ducts to form a complete underground raceway system.
 2. “Duct,” “conduit” and “raceway” are used interchangeably in this specification and have the same meaning. Refer to Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS, for approved raceway and materials as well as execution.
 3. Scope of Work: Furnishing, installation and connection of manholes, handholes and ducts to form a complete underground raceway system for distribution of electrical and signal systems and utility service entrance facilities. This specification shall also provide guidance for construction of the utility company underground and substructure requirements. Contact serving company directly and obtain current detailed requirements of installation and adhere by same. Provide trenching, conduit, backfill, boxes and equipment pads as applicable. Nothing here in shall be construed to be in conflict with the requirements of the utility company, which shall take precedence over any possible conflicting requirement.
- B. Related Work:
1. Sitework.
 2. Flatwork.
 3. Landscaping.
 4. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 5. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings and boxes for raceway systems.
 6. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

SECTION 260546.13 – ELECTRIC UTILITY SYSTEMS

1.03 1.02 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include manholes, handholes, duct materials, and hardware. Proposed deviations from details on the drawings shall be clearly marked on the submittals.
 - 3. If necessary to locate manholes or handholes at locations other than shown on the drawings, show the proposed locations accurately on scaled site drawings.
 - 4. Precast manholes and handholes: Submit detail drawings and design calculations for approval prior to installation.

1.04 1.03 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. UL 467 Grounding and Bonding Equipment.
 - 2. UL 651 Schedule 40 and 80 Rigid PVC Conduit.
 - 3. UL 6 Electrical Rigid Metal Conduit-Steel.
- C. National Fire Protection Association (NFPA):
 - 1. 70 California Electrical Code (CEC).
- D. National Electrical Manufacturers Association (NEMA):
 - 1. RN 1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 2. TC 2 Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 3. TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- E. American Concrete Institute (ACI):
 - 1. 318 Building Code Requirements for Structural Concrete.
- F. American Society for Testing and Materials (ASTM):
 - 1. C478 Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - 2. C478M Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

SECTION 260546.13 – ELECTRIC UTILITY SYSTEMS

3. F512-95 Standard Specification for Smooth-Wall Polyvinyl Chloride (PVC) Conduit and Fittings for Underground Installation.
- G. Utility company Handout Package and Construction Requirements for Underground and Substructure Installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete: ACI 318, 3000 psi minimum 28 day compressive strength.
- B. Reinforcing Steel: Number 4 minimum.
- C. Manhole Hardware:
1. Frames and covers (traffic type).
 2. Sump frames and gratings.
 3. Pulling Irons: 7/8-inch diameter hot dipped galvanized steel bar with exposed triangular shaped opening.
 4. Cable supports:
 - a. Cable stanchions, hot rolled, heavy duty, hot dipped galvanized "T" section steel 2-1/4-inch by 1/4-inch in size and punched with 14 holes on 1-1/2-inch centers for attaching cable arms.
 - b. Cable arms, 3/16-inch gage, hot rolled, hot dipped galvanized sheet steel pressed to channel shape. Arms shall be approximately 2-1/2 inches wide and 14 inches long.
 - c. Insulators for cable supports, high-glazed, wet process porcelain.
 - d. Spares: Equip each cable stanchion with two spare cable arms and six spare insulators for future use.
 - e. Miscellaneous hardware, hot dipped galvanized steel.
- D. Handhole Hardware:
1. Frames and covers configuration as shown on the drawings.
 2. Pulling irons, 7/8-inch diameter galvanized steel bar with exposed triangular shaped opening.
- E. Cable supports are not required.
- F. Ground Rod Sleeve: Provide a 3-inch PVC sleeve in manhole floors so that a driven ground rod may be installed.
- G. Manholes and Handholes shall be precast units and be constructed as described below. Units shall comply with ASTM C478, C478M.
1. Size: Plan area and clear height shall be not less than that shown on the drawings.

SECTION 260546.13 – ELECTRIC UTILITY SYSTEMS

2. Accessories, hardware, and facilities shall be the same as required for poured in place type.
 3. Assume ground water level 3 feet below ground surface unless a higher water table is shown in the boring logs and adjust design accordingly.
- H. Ducts:
1. Size shall be as shown on drawings.
 2. Ducts (concrete encased):
 - a. Plastic Conduit:
 - 1) NEMA TC6, 8, and TC9 plastic utilities conduit UL 651 and 651A Schedule 40 PVC.
 - 2) Duct shall be suitable for use with 90 deg C rated conductors.
 3. Ducts (direct burial):
 - a. Plastic duct:
 - 1) NEMA TC2 and TC3, EPC-40, Type II.
 - 2) UL 651 and 651A, Schedule 40 Schedule 80 PVC.
 - 3) Duct shall be suitable for use with 75 deg C rated conductors.
 - b. Rigid metal conduit, PVC-coated: UL6 and NEMA RN1 galvanized rigid steel, threaded type, coated with PVC sheath bonded to the galvanized exterior surface, nominal 0.040-inch thick.
- I. Ground Rods: Per Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- J. Ground Wire: Stranded bare copper No. 6 AWG minimum.
- K. Conduit Spacers: Prefabricated plastic.
- L. Warning Tape: Standard 4 mil polyethylene 3-inch-wide tape, detectable type, red with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW."
- M. Pull Rope: Plastic with 200 lb minimum tensile strength.

PART 3 - EXECUTION

3.01 TRENCHING

- A. Refer to EARTHWORK section of specification for trenching back-filling, and compaction requirements.
- B. Work with extreme care near existing ducts, conduits, cables, and other utilities to avoid damaging them.
- C. Cut the trenches neatly and uniformly for utility company trenches, notify for inspections by utility company a minimum of 48 hours in advance.

SECTION 260546.13 – ELECTRIC UTILITY SYSTEMS

- D. Conduits to be installed under existing paved areas, roads, and railroad tracks which are not to be disturbed shall be protected into place. Conduits shall be minimum 36" cover.
- E. Trench Preparation: A 4-inch sand bedding is required if trench bottom is not rock free. A 4-inch sand covering over the cable is required if the native backfill is not rock free. Backfill and compaction should meet City, County, State and utility company requirements. The serving utility company may require 100 percent sand backfill. All backfill requirements shall also meet or exceed those set forth in the earthwork or civil section of this specification.
- F. Excavation: Provide 6 inches of gravel in bottom of excavated holes for subsurface transformers and all concrete boxes. Spare gravel shall be available for final adjustment. The Contractor is responsible for final grade level of enclosures and boxes. Non-conformance will be corrected by electrical contractor at his expense.
- G. Conduit Routing: Sharp turns, bends, or other irregularities in the conduit must be avoided. Minimum radius bends shall be as required by the serving utility company. Every effort should be made to obtain a straight water tight conduit line. The end of all spare conduits must be capped. The utility company Inspector must approve deviation from layout.
- H. Conformance: All work must conform to the utility company "handout package" and Specification 59 and/or 99. Copies are available from the utility company upon request.
- I. Joint Trenching: Maintain all required depths, clearance, and separations as required by code, ordinance or utility company policies. Coordinate with other utilities to confirm requirements.

3.02 3.02 OTHER PAD-MOUNTED EQUIPMENT

- A. Provide adequately sized and reinforced concrete pads with openings for conduit(s) as necessary by the utility company and or the equipment manufacturer.
- B. A grounding system shall be installed at each pad-mounted piece of equipment including, but not limited to, a ground rod, grounding conductor, ufer, and ground grid (if called for).

SECTION 260546.13 – ELECTRIC UTILITY SYSTEMS

- C. Pad-mounted equipment shall be bolted to concrete pad with minimum 5/8-inch x 7-1/2-inch anchor bolts, one in each of four corners of each section of pad-mounted equipment.

END OF SECTION

SECTION 260546.16
TELEPHONE UTILITY SERVICE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Related Work:
 - 1. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 - 2. Section 310000, EARTHMOVING.

1.02 WORK INCLUDED

- A. Contact the serving utility company at start of construction and again 30 days prior to date that service cable placement will be required.
- B. Compliance with Standards: the serving utility company reserves the right to refuse to use any conduit, pullboxes, manholes or utility boxes that deviate from applicable building codes, plans and/or specifications.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.04 DEFINITIONS

- A. MTTB: Main Telephone Terminal Board.
- B. RNC: Rigid nonmetallic conduit.
- C. UFER: concrete-encased electrode.

SECTION 260546.16 – TELEPHONE UTILITY SERVICE

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Main Telephone Terminal Board (MTTB) shall be provided with a #6 THHN solid copper ground wire in 1/2-inch conduit run to a main electric service ground: either the concrete-encased electrode ("UFER") or the metal underground water pipe. Provide with minimum of 30-inch clear working space shall be provided in front of MTTB. If in a closet, no door sills or center posts shall obstruct access.
- B. Interior MTTB shall be 3/4-inch-thick plywood sized and located per plan. Fasten securely to wall. Provide with adjacent 120-volt double duplex receptacle on dedicated 20-amp circuit.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Service Conduits shall be RNC Schedule 40 or GT-80 below grade except at bends up to and including above grade which shall be RNC Schedule 80. Verify with utility prior to installation.
 - 1. Mandrel and measure conduits end-to-end to facilitate the utility ordering of cables.
 - 2. Provide minimum 3/16-inch pull rope in each conduit.
 - 3. Minimum cover for conduit shall be 30 inches.
 - 4. Minimum separation from power conduit(s) in joint trench shall be 12 inches of compacted soil or 3 inches of concrete.
 - 5. Conduits at backboard shall extend 2 inches above finish floor or 6 inches below ceiling and 1-inch out from face of backboard.
 - 6. Minimum radius of bends from trench to building shall be 36 inches.
- B. 300-foot conduit length and bending limits: Unless otherwise shown on the plan, service entrance conduit length shall not exceed for 4-inch conduit or 250 feet for 2-inch conduit. Not including risers, conduits shall have a maximum of 270 degrees total of bending including a maximum of two 90 degree bends. If these limits are exceeded, a pull box will be required.
- C. All manholes, pullboxes and utility boxes shall be sized per plan with cover marked "TELEPHONE" as manufactured by Associated Concrete or Plastic Products "Quikset," Brooks, Christy or equal as approved by the utility company.
 - 1. Pullboxes shall be provided with cable racking and torsion parkway cover. If required by the utility, also provide with 5-foot ground rod driven 4 feet into ground.

SECTION 260546.16 – TELEPHONE UTILITY SERVICE

2. Utility boxes shall be provided with 5-foot ground rod driven 4 feet into ground if required by the utility.

END OF SECTION

SECTION 260546.19

CABLE TELEVISION (CATV) UTILITY SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Related Work:
 - 1. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 - 2. Section 310000, EARTHMOVING.

1.02 Work Included

- A. Contact the serving Cable Television (CATV) utility company at start of construction and again 30 days prior to date CATV service cable placement will be required.
- B. Compliance with Standards: The utility company reserves the right to refuse to use any conduit, pullboxes, manholes or utility boxes that deviate from applicable building codes, utility standards, plans and/or specifications.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide a complete conduit infrastructure for installation of the utility service cable. Materials shall comply with applicable portions of Specification Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

SECTION 260546.19 – CABLE TELEVISION (CATV) UTILITY SYSTEMS

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide all trenching, excavations, and rock-free backfill (1/4-inch screen) and service conduits. Notify serving company 48 hours before backfill.
- B. Service Conduits shall be RNC Schedule 40 or GT-80 below grade except at bends up to and including above grade which shall be RNC Schedule 80. Verify with utilities prior to installation.
 - 1. Mandrel and measure conduits end-to-end to facilitate installation of CATV cables.
 - 2. Provide minimum 3/16-inch pull rope in each conduit.
 - 3. Minimum cover for conduit shall be 24 inches.
 - 4. Minimum separation from power conduit(s) in joint trench shall be 12 inches of compacted soil or 3 inches of concrete.
 - 5. Conduits at backboard shall extend 2 inches above finish floor or 6 inches below ceiling and 1-inch out from face of backboard.
 - 6. Minimum radius of bends from trench to building shall be 36 inches.
- C. Conduit length and bending limits: Unless otherwise shown on the plan, service entrance conduit length shall not exceed 500 feet. Not including risers, conduits shall have a maximum of 270 degrees total of bending including a maximum of two 90-degree bends. If these limits are exceeded, a pull box will be required.
- D. All manholes, pullboxes and utility boxes shall be sized per plan with cover marked "Cable TV" as manufactured by Associated Concrete or Plastic Products "Quikset," Brooks, Christy or equal as approved by utility company.
- E. Conduits must enter boxes with a 90-degree sweep and shall be no more than a 15-degree angle from the main line trench.
- F. Pullropes: Install 3/16-inch polypropylene 800 lb minimum test pull line in 2-inch conduits and 1/8-inch polypropylene 200 lb minimum test pull line in 1-inch conduits.
- G. Locations of existing underground facilities shall be obtained by calling Underground Service Alert at least 48 hours in advance: Phone (800) 642-2444.

END OF SECTION

SECTION 260548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Isolation pads.
 - 2. Channel support systems.
 - 3. Restraint cables.
 - 4. Hanger rod stiffeners.
 - 5. Anchorage bushings and washers.
- B. Related Sections include the following:
 - 1. Section 260529, HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS, for commonly used electrical supports and installation requirements.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.04 DEFINITIONS

- A. The IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

1.05 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:

SECTION 260548 – VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC:
 - a. Component Importance Factor: 1.0.
 - b. Component Response Modification Factor: 3.0.
 - c. Component Amplification Factor: 2.5.
3. Design Spectral Response Acceleration at Short Periods (0.2-Second):
SDS=1.361g.
4. Design Spectral Response Acceleration at 1.0-Second Period:
SD1=0.663g.

1.06 ACTION SUBMITTALS

- A. Product Data: For the following:
 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

1.07 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Qualification Data: For testing agency.
- C. Welding certificates.
- D. Field quality-control test reports.

1.08 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

**SECTION 260548 – VIBRATION AND SEISMIC CONTROLS
FOR ELECTRICAL SYSTEMS**

- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ace Mountings Co., Inc.
 - 2. Amber/Booth Company, Inc.
 - 3. California Dynamics Corporation.
 - 4. Isolation Technology, Inc.
 - 5. Kinetics Noise Control.
 - 6. Mason Industries.
 - 7. Vibration Eliminator Co., Inc.
 - 8. Vibration Isolation.
 - 9. Vibration Mountings & Controls, Inc.
- C. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
 - 1. Resilient Material: Oil- and water-resistant rubber.

2.02 SEISMIC-RESTRAINT DEVICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

SECTION 260548 – VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

1. Amber/Booth Company, Inc.
 2. California Dynamics Corporation.
 3. Cooper B-Line, Inc.; a division of Cooper Industries.
 4. Hilti Inc.
 5. Loos & Co.; Seismic Earthquake Division.
 6. Mason Industries.
 7. TOLCO Incorporated; a brand of NIBCO INC.
 8. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- D. Restraint Cables: ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

**SECTION 260548 – VIBRATION AND SEISMIC CONTROLS
FOR ELECTRICAL SYSTEMS**

2.03 FACTORY FINISHES

- A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
 - 1. Install restrained isolators on electrical equipment.
 - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125-inch (3.2 mm).
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

SECTION 260548 – VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways and cables where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections.

SECTION 260548 – VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Engineer before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least 7 days advance notice.
 - 3. Obtain Engineer's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least four of each type and size of installed anchors and fasteners selected by Engineer.
 - 5. Test to 90 percent of rated proof load of device.
 - 6. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 260553

IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:

1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
 - a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
 - 1) Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets, motors, generators, transfer switches.
 - 2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
 - 3) Wall switches not within sight of outlet controlled.
 - 4) Special systems such as, but not limited to, telephone, fire alarm, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator, and pullbox.
 - 5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.
2. Conductor and Cable Identification.

- B. Related Work:

1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
3. Section 262413, SERVICE AND DISTRIBUTION SWITCHBOARD.
4. Section 262416, PANELBOARDS.

SECTION 260553 – IDENTIFICATION OF ELECTRICAL SYSTEMS

5. Section 262726, WIRING DEVICES.
6. Section 262816, ENCLOSED SWITCHES AND CIRCUIT BREAKERS.
7. Section 263213, EMERGENCY GENERATOR SYSTEM.
8. Section 263623, AUTOMATIC TRANSFER AND BYPASS-ISOLATION SWITCHES.
9. Section 283110, FIRE SPRINKLER MONITORING AND ALARM SYSTEM.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABEL DESIGNATIONS

- A. Equipment labels indicating equipment designations both emergency and normal. Designation data per drawings or to be supplied with shop drawings approval.
- B. Panelboard labels showing panel designation, voltage, phase and source.
- C. In accordance with California Electric Code (CEC) 110.16, provide arc flash protection warning labels on all switchboards, panelboards, distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per American National Standards Institute (ANSI) Z535.4 guidelines.

2.02 MATERIALS

- A. For Labels: Three-layer laminated plastic or micarta with engraved white letters over black background.
- B. For Emergency Equipment: Use engraved white letters over red background.
- C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.
- D. Arc flash labels shall be provided as required by CEC Article 70E.
- E. Conductor tape number markers: TayMac MX4280 Series non-fading permanent adhesive.

SECTION 260553 – IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 3 - EXECUTION

3.01 MOUNTING

- A. Equipment labels shall be mounted by self-tapping, threaded screws and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.
- B. Conductor tape markers shall be consistently placed for ready conductor identification.

3.02 HEIGHTS ON LABELS

- A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4-inch identify equipment designation; 1/8-inch identify voltage rating and source.
- B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16-inch identify circuit and load served, including location of equipment.
- C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16-inch identify load served.
- D. Transformers: 3/16-inch identify equipment designation; 1/8-inch identify primary and secondary voltages, primary source and secondary load. Include location of primary source or secondary load if remote from transformer.

3.03 WARNING SIGNS

- A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.
- B. Warning signs to read "DANGER - HIGH VOLTAGE," with letters 1-1/2 inches high, 3/16-inch stroke minimum.
- C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.

END OF SECTION

SECTION 260573

OVERCURRENT PROTECTIVE DEVICE COORDINATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section specifies the requirements of the Overcurrent Protective Device Coordination.
- B. A short circuit and coordination study shall be prepared for the electrical overcurrent devices to be installed under this project to assure selective coordination, proper equipment and personnel protection.
- C. The study shall present an organized time current analysis of each protective device in series from the individual overcurrent device back to the utility and the on-site generator sources. The study shall reflect the operation of each device during normal and abnormal current conditions.
- D. Implement as part of this contract, all manufacturer's recommendations for maximum protection and best selective coordination at no additional cost to Owner.
- E. The Contractor shall furnish an ARC Flash analysis study per NFPA 70E, Standard for Electrical Safety in the Workplace, Reference Article 130.3 and Appendix D.
- F. The Coordination Study must be done prior to ordering the equipment to ensure all breakers and panels are all coordinated based on the report.

1.02 RELATED WORK

- A. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Section 262413, SERVICE AND DISTRIBUTION SWITCHBOARDS: Low voltage distribution switchboards.
- C. Section 262416, PANELBOARDS: Low voltage panelboards.

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

1.03 SUBMITTALS

- A. In accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL, submit the following:
 - 1. Complete short circuit and coordination study as described herein.
 - 2. Protective equipment shop drawings shall be submitted simultaneously with or after the protective device study. Protective equipment shop drawings will not be accepted prior to protective device study.
 - 3. Certification: Two weeks prior to final inspection, submit four copies of the following to the Engineer:
 - a. Certification by the Contractor that the protective devices have been adjusted and set in accordance with the approved protective device study.
 - b. Final setting values for each adjustable trip device.

1.04 REFERENCES

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE 141, Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
 - 2. IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
 - 3. IEEE 399, Recommended Practice for Industrial and Commercial Power System Analysis.
 - 4. IEEE 241, Recommended Practice for Electric Power Systems in Commercial Buildings.
 - 5. IEEE 1015, Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
 - 6. IEEE 1584, Guide for Performing Arc-Flash Hazard Calculations.
- B. American National Standards Institute (ANSI):
 - 1. ANSI C57.12.00, Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 - 2. ANSI C37.13, Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures.
 - 3. ANSI C37.010, Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
 - 4. ANSI C 37.41, Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
- C. The National Fire Protection Association (NFPA):
 - 1. NFPA 70, National Electrical Code, latest edition.
 - 2. NFPA 70E, Standard for Electrical Safety in the Workplace.

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

1.05 QUALIFICATIONS

- A. The protective device study shall be prepared by qualified engineers of the high voltage switchgear manufacturer or an approved consultant. The Contractor is responsible for providing all pertinent information required by the preparers to complete the study. Submit engineer's qualifications with study.

1.06 REQUIREMENTS

- A. The complete study shall include a system one line diagram, short circuit and ground fault analysis, and protective coordination plots.
- B. One Line Diagram:
 - 1. Show on the one-line diagram, all electrical equipment and wiring to be protected by the overcurrent devices installed under this project. Clearly show, on the one-line, the schematic wiring of the electrical distribution system.
 - 2. Also show on the one line diagram the following specific information:
 - a. Calculated fault impedance, X/R ratios, and short circuit values at each bus.
 - b. Breaker and fuse ratings.
 - c. Generator kW and Transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.
 - d. Voltage at each bus.
 - e. Identification of each bus.
 - f. Conduit material, feeder sizes, length, and X/R ratios.
- C. Short Circuit Study:
 - 1. Systematically calculate the fault impedance to determine the available short circuit and ground fault currents at each bus. Incorporate the motor contribution in determining the momentary and interrupting ratings of the protective devices.
 - 2. The study shall be calculated by means of a computer program. Pertinent data and the rationale employed in developing the calculations shall be incorporated in the introductory remarks of the study.
 - 3. Present the data determined by the short circuit study in a table format. Include the following:
 - a. Device identification.
 - b. Operating voltage.
 - c. Protective device.
 - d. Device rating.
- D. Calculated short circuit current.
- E. Coordination Curves:
 - 1. Prepare the coordination curves to determine the required settings of protective devices to assure selective coordination. Graphically illustrate

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

on log paper that adequate time separation exists between series devices, including the utility company upstream device. Plot the specific time current characteristics of each protective device in such a manner that all upstream devices will be clearly depicted on one sheet.

2. The following specific information shall also be shown on the coordination curves:
 - a. Device identification.
 - b. Voltage and current ratio for curves.
 - c. 3-phase and 1-phase ANSI damage points for each transformer.
 - d. No damage, melting, and clearing curves for fuses.
 - e. Cable damage curves.
 - f. Transformer inrush points.
 - g. Maximum short circuit cutoff point.
3. Develop a table to summarize the settings selected for the protective devices. Include the following in the table:
 - a. Device identification.
 - b. Relay CT ratios, tap, time dial, and instantaneous pickup.
 - c. Circuit breaker sensor rating, long time, short time, and instantaneous settings, and time bands.
 - d. Fuse rating and type.
 - e. Ground fault pickup and time delay.

1.07 ANALYSIS

- A. Analyze the short circuit calculations, and highlight any equipment that is determined to be underrated as specified. Propose approaches to effectively protect the underrated equipment.
- B. After developing the coordination curves, highlight areas lacking coordination. Present a technical evaluation with a discussion of the logical compromises for best coordination.

1.08 ADJUSTMENTS, SETTINGS AND MODIFICATIONS

- A. Necessary final field adjustments, settings and minor modifications shall be made to conform with the protective device study without additional cost to the Owner.
- B. All final circuit breaker and relay settings and fuse sizes shall be made in accordance with the recommendations of the protective device study.

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

PART 2 - PRODUCTS

2.01 STUDIES

- A. Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer or an approved consultant.
- B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E, Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D.

2.02 DATA COLLECTION

- A. Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source combination may include present and future motors and generators.
- C. Load data utilized shall include proposed loads obtained from Contract Documents provided by Owner, or Contractor.
- D. Include fault contribution of existing motors in the study, with motors greater than 25 hp. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

- A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standards 141-1993.
- B. Transformer design impedances shall be used when test impedances are not available.
- C. Provide the following:
 - 1. Calculation methods and assumptions.
 - 2. Selected base per unit quantities.
 - 3. One-line diagram of the system being evaluated.
 - 4. Source impedance data, including electric utility system and motor fault contribution characteristics.
 - 5. Typical calculations.

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

6. Tabulations of calculated quantities.
 7. Results, conclusions, and recommendations.
- D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
1. Electric utility's supply termination point.
 2. Incoming switchgear.
 3. Unit substation primary and secondary terminals.
 4. Low voltage switchgear.
 5. Motor control centers.
 6. Standby generators and automatic transfer switches.
 7. Branch circuit panelboards.
 8. Other significant locations throughout the system.
- E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- F. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
 2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
 3. Adequacy of transformer windings to withstand short-circuit stresses.
 4. Cable and busway sizes for ability to withstand short-circuit heating.
 5. Notify Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

- A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.
- B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
- D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the curve sheets, where applicable:
1. Electric utility's protective device.
 2. Medium voltage equipment relays.
 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

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4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
 5. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.
 6. Conductor damage curves.
 7. Ground fault protective devices, as applicable.
 8. Pertinent motor starting characteristics and motor damage points.
 9. Pertinent generator short-circuit decrement curve and generator damage point.
 10. Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center.
- F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.05 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
- B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.
- C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- D. The Arc-Flash Hazard Analysis shall include all significant locations in 208 volt systems fed from transformers equal to or greater than 45 kVA.
- E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
- F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
- G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

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- H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 Section B.1.2.

2.06 REPORT SECTIONS

- A. Input Data:
 - 1. Short-circuit reactance of rotating machines.
 - 2. Cable and conduit materials.
 - 3. Bus ducts.
 - 4. Transformers.
 - 5. Reactors.
 - 6. Aerial lines.
 - 7. Circuit resistance and reactive values.

- B. Short-Circuit Data:
 - 1. Source fault impedance and generator contributions.
 - 2. X to R ratios.
 - 3. Asymmetry factors.
 - 4. Motor contributions.
 - 5. Short circuit kVA.
 - 6. Symmetrical and asymmetrical fault currents.

- C. Recommended Protective Device Settings:
 - 1. Phase and Ground Relays:
 - a. Current transformer ratio.
 - b. Current setting.
 - c. Time setting.
 - d. Instantaneous setting.
 - e. Specialty non-overcurrent device settings.
 - f. Recommendations on improved relaying systems, if applicable.
 - 2. Circuit Breakers:
 - a. Adjustable pickups and time delays (long time, short time, ground).
 - b. Adjustable time-current characteristic.
 - c. Adjustable instantaneous pickup.
 - d. Recommendations on improved trip systems, if applicable.

- D. Incident energy and flash protection boundary calculations:
 - 1. Arcing fault magnitude.
 - 2. Device clearing time.
 - 3. Duration of arc.
 - 4. Arc flash boundary.
 - 5. Working distance.
 - 6. Incident energy.
 - 7. Hazard Risk Category.
 - 8. Recommendations for arc flash energy reduction.

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

PART 3 - EXECUTION

3.01 EQUIPMENT AND FIELD ADJUSTMENTS

- A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- B. Make modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies and include all recommendations.
- C. Following completion of all studies, acceptance testing and startup by the field engineering service division of the equipment manufacturer, a 2-year warranty shall be provided on all components manufactured by the engineering service parent manufacturing company.

3.02 ARC FLASH WARNING LABELS

- A. The Contractor shall provide a 3.5-inch x 5-inch thermal transfer type label of high adhesion polyester for each work location analyzed, a sample is included in this specification.
- B. The label shall have an orange header with the wording, “WARNING, ARC FLASH HAZARD”, and shall include the following information:
 - 1. Location designation.
 - 2. Nominal voltage.
 - 3. Flash protection boundary.
 - 4. Hazard risk category.
 - 5. Incident energy.
 - 6. Working distance.
 - 7. Engineering report number, revision number and issue date.
- C. Labels shall be machine printed, with no field markings.
- D. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
 - 1. For each 600, 480, and applicable 208 volt panelboards, one arc flash label shall be provided.
 - 2. For each motor control center, one arc flash label shall be provided.
 - 3. For each low voltage switchboard, one arc flash label shall be provided.
 - 4. For each switchgear, one flash label shall be provided.
 - 5. For medium voltage switches one arc flash label shall be provided.

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICE COORDINATION

- E. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

3.03 ARC FLASH TRAINING

- A. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

		WARNING	LABEL # 0001
		ARC FLASH HAZARD	
LINE SIDE of MAIN	FLASH PROTECTION BOUNDARY: 40 inches	HAZARD RISK CATEGORY: CLASS 2	
		INCIDENT ENERGY RANGE: 4 – 8 cal/cm²	
LOAD SIDE of MAIN	FLASH PROTECTION BOUNDARY: 20 inches	HAZARD RISK CATEGORY: CLASS 0	
		INCIDENT ENERGY RANGE: 0 – 2 cal/cm²	
PSE TQS#: #####.#	Date Issued: April 2004	Study Rev.: 0	
LOCATION: BUS NAME	PROTECTIVE DEVICE:	UPSTREAM DEVICE	

END OF SECTION

SECTION 260810

ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Testing, evaluation and calibration of equipment provided, installed and connected in Division 26, ELECTRICAL.
 - 2. Evaluation of connection and normal operation of utilization equipment, provided in other Divisions, for installation and connection in Division 26, ELECTRICAL.
- B. Related Work:
 - 1. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
 - 2. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
 - 3. Section 260573, OVERCURRENT PROTECTIVE DEVICE COORDINATION.
 - 4. Section 262416, PANELBOARDS.
 - 5. Section 262816, ENCLOSED SWITCHES AND CIRCUIT BREAKERS.
 - 6. Section 263213, EMERGENCY GENERATOR SYSTEM.
 - 7. Section 263623, AUTOMATIC TRANSFER AND BYPASS-ISOLATION SWITCHES

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

SECTION 260810 – ELECTRICAL ACCEPTANCE TESTING

1.04 REFERENCES

- A. Acceptance Testing Criteria: Latest edition of Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, published by IETA.
- B. Applicable Codes, Standards and References:
 - 1. National Electrical Code (NEC).
 - 2. National Electrical Manufacturer's Association (NEMA).
 - 3. American Society for Testing and Materials (ASTM).
 - 4. Institute of Electrical and Electronic Engineers (IEEE).
 - 5. International Electrical Testing Association (IETA).
 - 6. American National Standards Institute (ANSI).
 - 7. State and local codes and ordinances.
 - 8. Insulated Power Cable Engineers Association (IPCEA).
 - 9. Association of Edison Illuminating Companies (AEIC).
 - 10. OSHA Part 1910; Subpart S, 1910.308.
 - 11. National Fire Protection Association (NFPA).

1.05 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Retain the services of a recognized independent testing firm for the purpose of performing inspections and tests as specified herein.
 - 2. Independent test firm providing report direct to Architect.
 - 3. All material, equipment, labor and technical supervision to perform tests and inspections provided by testing firm.
 - 4. It is the intent of these tests to assure that all electrical equipment, Contractor or Owner supplied, is operational within industry and manufacturer's tolerances and is installed in accordance with design Specifications.
 - 5. Tests and inspections determine suitability for energization.
 - 6. Supply to the independent testing organization complete sets of approved shop drawings, coordination study (provided by Contractor's equipment supplier under Contractor's direction, setting of all adjustable devices and other information requested by testing agency).
- B. Scope of Testing, Evaluation and Calibration:
 - 1. Low voltage circuit breakers.
 - 2. Switchboards.
 - 3. Ground fault protective signaling.
 - 4. Protective relays and associated instrument transformers.
 - 5. Grounding systems.
 - 6. Generators.
 - 7. Automatic transfer switches and By-Pass Isolation Switch

SECTION 260810 – ELECTRICAL ACCEPTANCE TESTING

1.06 SUBMITTALS

- A. Test Reports:
 - 1. Maintain written record of all tests.
 - 2. At completion of project, assemble and certify a final test report. Submit report to Architect prior to final acceptance to include:
 - a. Summary of project.
 - b. Description of equipment tested.
 - c. Visual inspection report.
 - d. Description of tests.
 - e. Test results.
 - f. Conclusions and recommendations.

1.07 QUALITY ASSURANCE

- A. Qualifications of Testing Firm:
 - 1. Corporately independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers and installers of equipment or systems evaluated by testing firms.
 - 2. Independent organization as defined by OSHA Title 29, Part 1936 and IETA.
 - 3. Regularly engaged in the testing of electrical materials, devices, appliances, electrical installations and systems for the purpose of preventing injury to persons or damage to property and other equipment.
 - 4. Engaged in testing practices for minimum of 2 years.
 - 5. Use only full-time technicians, regularly employed by firm for testing services. Electrically unskilled employees are not permitted to perform testing or assistance of any kind. Electricians and line workers may assist, but may not perform testing or inspection services.
 - 6. Submit proof of above qualifications with Bid Documents.
- B. Certifications:
 - 1. Comply with OSHA criteria for accreditation of testing laboratories, Title 29, Parts 1907, 1910 and 1936. Full membership in the IETA constitutes proof of such criteria.
 - 2. Lead, on site, technical person currently certified by IETA in Electrical Power Distribution System Testing.
 - 3. All instruments used by testing firm to evaluate electrical performance meet IETA Specifications for Test Instruments.

SECTION 260810 – ELECTRICAL ACCEPTANCE TESTING

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Tests:
1. Contractor's Responsibilities:
 - a. Perform routine insulation resistance, continuity and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by testing firm.
 - b. Notify the testing firm when equipment becomes available for acceptance tests. Coordinate work to expedite project scheduling.
 2. Testing Firm's Responsibilities:
 - a. Notify Architect prior to commencement of any testing.
 - b. Report directly to Architect any systems, material or installation found defective on the basis of acceptance tests.
 - c. Provide auxiliary portable power supply necessary for conducting tests.

3.02 ADJUSTING

- A. Final Settings: Testing firm responsible for implementing all final settings and adjustments on protective devices and tap changes in accordance with Architect's specified values.

END OF SECTION

SECTION 260943
NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.
- B. The system shall be capable of turning lighting loads on/off as well as dimming lights.
- C. All system devices shall be networked together enabling digital communication and shall be individually addressable.
- D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity even if network connectivity to the greater system is lost.
- E. The system architecture shall facilitate remote operation via a computer connection.
- F. The system shall not require any centrally hardwired switching equipment.

1.02 SUBMITTALS

- A. Product Datasheets (general device descriptions, dimensions, wiring details, nomenclature).
- B. Riser Diagrams – typical per room type (detailed drawings showing device interconnectivity of devices).
- C. Other Diagrams – as needed for special operation or interaction with other system(s).
- D. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up.
- E. Hardware and Software Operation Manuals.
- F. Other operational descriptions as needed.

SECTION 260943 – NETWORK LIGHTING CONTROLS

1.03 QUALITY ASSURANCE

- A. All steps in sensor manufacturing process shall occur in the USA; including population of all electronic components on circuit boards, soldering, programming, wiring, and housing.
- B. All components and the manufacturing facility where product was manufactured must be ROHS compliant.
- C. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 deg F (and Celsius) operation.
- D. All applicable products must be UL/CUL Listed or other acceptable national testing organization.

1.04 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.05 COORDINATION

- A. Coordinate lighting control components to form an integrated interconnection of compatible components.
- B. Coordinate lighting controls with BAS (if necessary) either through IP-based intercommunication of system or hardwired auxiliary relay outputs.
- C. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

1.06 WARRANTY

- A. All devices in lighting control system shall have a 5-year warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Shall be reviewed by the Electrical Engineer of Record and the Architect/Owner prior to approval.

SECTION 260943 – NETWORK LIGHTING CONTROLS

2.02 SYSTEM REQUIREMENTS

- A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices, 2) standalone lighting control zones, 3) network backbone for remote or time based operation.
- B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- C. System must interface directly with intelligent LED luminaires.
- D. Intelligent lighting control devices shall communicate wirelessly.
- E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- F. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- G. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- H. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- I. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e., not in a remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.
- J. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control profiles.
- K. Individual lighting zones shall be capable of being segmented into several channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- L. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces

SECTION 260943 – NETWORK LIGHTING CONTROLS

sequence of operation according to a time schedule so as to enable customized time-of-day, day-of-week utilization of a space. Note operating modes should be utilized only in manners consistent with local energy codes.

1. Auto-On / Auto-Off (via occupancy sensors):
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 - c. Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic On functionality.
2. Manual-On / Auto-Off (also called Semi-Automatic):
 - a. Pushing a switch will turn lights on.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
3. Manual-On to Auto-On/Auto-Off:
 - a. Pushing a switch will turn lights on.
 - b. After initial lights on, zones with occupancy and/or photocell sensors turn lights on/off according to occupancy/vacancy and/or daylight conditions.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
4. Auto-to-Override On:
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
5. Manual-to-Override On:
 - a. Pushing a switch will turn lights on.
 - b. Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
6. Auto On / Predictive Off:
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 - c. If switch is pressed, lights turn off and a short “exit timer” begins. After timer expires, sensor scans the room to detect whether occupant is still present. If no occupancy is detected, zone returns to

SECTION 260943 – NETWORK LIGHTING CONTROLS

auto-on. If occupancy is detected, lights must be turned on via the switch.

7. Multi-Level Operation (multiple lighting levels per manual button press):
 - a. Operating mode designed specifically for bi-level applications.
 - b. Enables the user to cycle through the up to four potential on/off lighting states using only a single button.
 - c. Eliminates user confusion as to which of two buttons controls which load.
 - d. Three different transition sequences are available in order to comply with energy.

2.03 INDIVIDUAL DEVICE SPECIFICATIONS

- A. Control Module (Gateway):
 1. Module shall be a wall mounted user accessible device that is capable of communicating and controlling downstream system control devices and linking into an Ethernet.
 2. Devices shall be powered by low voltage, fit within a two gang switch box (or mounting ring), and have a backlit LCD panel.
 3. User control shall be made available via finger-touch buttons with no moving parts. Buttons shall be capable of being locked for security.
- B. Networked System Occupancy Sensors:
 1. Occupancy sensors system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
 2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
 3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
 4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
 5. All sensing technologies shall be acoustically passive meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.

SECTION 260943 – NETWORK LIGHTING CONTROLS

- C. Networked System Daylight (Photocell and or Dimming) Sensors:
1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
 2. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Minimum and maximum dim settings as well as set-point may be manually entered.
 3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
 4. Dimming sensors shall control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more ballasts).
 5. Photocell and dimming sensors shall be equipped with an automatic override for 100-hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
 6. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
 7. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.
 8. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC, 277 VAC, and 347 VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load. Relays shall be dry contacts.
- D. Networked System Relay and Dimming Panels:
1. Panel shall incorporate up to four normally closed latching relays capable of switching 120/277 VAC or up to two Dual Phase relays capable of switching 208/240/480 VAC loads.
 2. Relays shall be rated to switch up to a 30A ballast load at 277 VAC.
 3. Panel shall provide one 0-10VDC dimming output paired with each relay.
 4. Panel shall power itself from an integrated 120/277 VAC supply.
 5. Panel shall be capable of operating as either two networked devices or as one.
- E. Networked LED Luminaires:
1. LED luminaire shall have a mechanically integrated control device.
 2. LED luminaire shall have two RJ-45 ports.
 3. LED luminaire shall be able to digitally network directly to other network control devices (sensors, photocells, switches, dimmers).

SECTION 260943 – NETWORK LIGHTING CONTROLS

2.04 START-UP AND SUPPORT FEATURES

- A. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.
- B. Once software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.
- C. All system devices shall be capable of being given user defined names.
- D. All devices within the network shall be able to have their firmware reprogrammed remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.
- E. All sensor devices shall have the ability to detect improper communication wiring and blink it's LED in a specific cadence as to alert installation/startup personnel.

END OF SECTION

SECTION 262413

SERVICE AND DISTRIBUTION SWITCHBOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Service and distribution switchboard where shown on the contract drawings and specified herein.

1.03 QUALITY ASSURANCE

- A. Conform to applicable Codes and NEMA, ANSI, and IEEE Standards.

1.04 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Shop Drawings shall show and contain the following information:
 - 1. Plans showing top and bottom of switchboards.
 - 2. Front, rear and side elevations of switchboards.
 - 3. Schematic Wiring Diagrams showing the following:
 - a. One-line diagram with each circuit numbered.
 - b. Schedule showing circuit number, description and rating of protective device(s).
 - c. Complete short circuit with standability of bus.
 - 4. 1/2-inch equal to 1-foot scale drawings of electrical rooms or areas overall dimensions for equipment layout including space available for conduits and protective devices.
- C. Manufacturer shall provide certification that the equipment supplied under this Section has been reviewed and certified to meet the current criteria for special seismic certification. Include seismic companion anchorage requirements from

SECTION 262413 – SERVICE AND DISTRIBUTION SWITCHBOARD

the testing and as approved by the manufacturer. The manufacturer shall provide an approved label on the equipment enclosure stating that the equipment has been awarded a certificate of compliance for special seismic certification.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Each switchboard shall be UL listed dead-front, dead-rear, completely self-supporting, with the required number of vertical sections bolted together to form one floor-standing switchboard. Construction shall be NEMA Class II with line and load and main bus connections accessible from the front. Provide switchboards of 1,000 amperes or greater rating with line and load insulated bus bars. Overcurrent protective devices shall be grouped in convertible type construction. Vertical sections shall have full height bussing and where space for future devices is indicated on the Drawings all the necessary mounting hardware shall be furnished. Switchboards shall include all protective devices and other equipment indicated on the Contract Drawings with the necessary interconnections, instrumentation, and control wiring. Bus shall be copper with plated joints, or tin plated aluminum. Bus bars shall be mounted on supports of high impact-resistant, non-tracking insulating material, and braced to withstand the maximum available fault current as indicated on the Contract Drawings. Other ratings shall be as indicated on the Contract Drawings. Series-connected or "integrated equipment" short circuit ratings shall not be applied in lieu of, or to comply with, short circuit and interrupting capacity ratings indicated on the Drawings, unless specifically approved by the Engineer.
- B. Service and distribution sections shall contain circuit breakers, fusible switches, and combination motor starters, with shunt trips, motor operators, ground fault protection, and other accessories, as indicated on the Drawings, as well as provisions for utility metering in accordance with the serving electric utility requirements. Each disconnecting means shall be provided with a means for individual padlocking. Switches shall be heavy-duty, quick-make and quick-break, and horsepower rated through 500 HP. Switches rated over 600 amperes shall be bolted pressure contact type. Ratings of disconnecting means and overcurrent protective devices shall be as indicated on the Drawings.
- C. Finish: Interior finish shall be a gray lacquer or enamel; exterior finish shall be a gray baked-on enamel or lacquer. Apply all finish coatings over a rust-inhibiting metal primer.
- D. Identification: Each switchboard shall have an engraved laminated plastic nameplate identifying the switchboard as designated and located on the Contract Drawings, and indicating voltage, phase, and number of system conductors. For example, "Switchboard MS 277/480V. 3Ø 4W. Lettering shall

SECTION 262413 – SERVICE AND DISTRIBUTION SWITCHBOARD

be white on black finish and 2 inches high minimum. Nameplates shall be affixed by a minimum of two escutcheon pins or screws. Each device on the switchboard shall be provided with an engraved plastic nameplate as specified in Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Switchboard(s) shall be securely bolted to the flooring or structure. Final attachment means shall be in compliance with the seismic requirements of governing authority. Shop Drawings indicating the bolt down requirements shall be provided by the manufacturer along with all necessary calculations and shall be submitted with the Shop Drawings of the switchboard equipment. Refer to other Sections of the Specifications related to seismic requirements.
- B. Switchboard(s) shall be installed on a level floor, with shims provided where necessary to attain both horizontal and vertical "plumb" conditions.
- C. Switchboard(s) equipment shall be protected during construction in such a manner to prevent plaster, paint, dust, etc. from defacing the finish of equipment. Prior to final acceptance of the equipment, the interior of the equipment shall be cleaned of all foreign materials and debris. Any blemishes or defects on the exterior of the equipment shall be repaired by painting the equipment with paint supplied by the manufacturer of the equipment to match the factory finishes.
- D. All floor mounted switchgear and panelboards shall be sealed with caulking between bottom of metal housing and the concrete pad or slab to prevent entrance of dust and debris.
- E. All openings in switchgear and panelboards that are unused shall be sealed with bolts and washers. Use caulking where holes or openings cannot be sealed by way of a washer, bolts, or conduit seals.
- F. All ventilated openings in panelboards and switchboards shall be furnished with dust filters to prevent entrance of dust and debris.
- G. No operating handles in any switchboard shall be located above 6 feet 6 inches above finish floor. Code clearances on all sides of the switchboard equipment shall be maintained.
- H. Switchboards shall be mechanically grounded to the grounding system.
- I. Furnish ammeters, voltmeters, current and potential transformers, test blocks, control switches, fuses and circuit breakers, and other devices as indicated on

SECTION 262413 – SERVICE AND DISTRIBUTION SWITCHBOARD

the Drawings. Meters shall be switchboard type semi-flush mounted, with phase selector switches. The height of all devices shall comply with Code and utility company requirements with the switchboard installed on a 2-inch-high concrete pad.

- J. For solidly grounded "wye" services of more than 150 volts to ground, but not exceeding 600 volts phase to phase, provide ground fault protection of equipment for each service disconnecting means for services rated 1000 amperes or more, without a single main disconnecting means. Provide ground fault protection of equipment for other systems as indicated on the Drawings.
- K. Ground fault sensors shall be zero sequence type unless indicated otherwise on the drawings. Trip settings shall be as indicated on the drawings or as directed by the Engineer.
- L. Protection: Keep switchboards covered during construction operations. Clean interior and exterior after all connections are completed. Factory connections shall be checked and re-torqued tight as required. Damage shall be field or factory repaired to a condition acceptable to the Engineer at no added cost to the Owner.
- M. Operational Test of the ground fault protection system using the primary current injection method shall be performed by qualified personnel with suitable testing/recording equipment in the presence of the Owner. Provide the Owner with a "Certified Test Report" including test parameters.

3.02 ACCEPTANCE TESTING OF SWITCHGEAR AND SWITCHBOARD ASSEMBLIES

- A. General:
 - 1. Inspect for physical damage.
 - 2. Compare equipment nameplate information with latest single line diagram and report discrepancies.
 - 3. Inspect for proper alignment, anchorage and grounding.
 - 4. Check tightness of accessible bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instruction for proper foot pound levels.
 - 5. Key interlock systems shall be physically tested to insure proper function.
 - a. Closure attempt shall be made on locked open devices. Opening attempt shall be made on locked closed devices.
 - b. Key exchange shall be made with devices operated in off-normal positions.
 - 6. All doors, panels and sections shall be inspected for paint, dents, scratches.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Panelboards.
- B. Related Work:
 - 1. Division 09, PAINTING: Identification and painting of panelboards.
 - 2. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 3. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Cables and wiring.
 - 4. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
 - 5. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.04 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. No. 50 Enclosures for Electrical Equipment.

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2. No. 67 Panelboards.
 3. No. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.
- C. National Fire Protection Association (NFPA):
1. No. 70-2016 California Electrical Code (CEC).
- D. National Electrical Manufacturers Association (NEMA):
1. No. PB-1 Panelboards.
 2. No. AB-3 Molded Case Circuit Breakers and Their Application.

PART 2 - PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall be in accordance with UL, NEMA, NEC, CEC and as shown on the drawings. Approved manufacturers are Cutler Hammer, Square D, Seimens, General Electric.
- B. Panelboards shall be standard manufactured products. All components of the panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards to be of the same manufacturer.
- C. All panelboards shall be dead front safety type. Arrange sections for easy removal without disturbing other sections.
- D. All panelboards shall be completely factory assembled with molded case circuit breakers. All factory wiring shall be checked for correct tightness and visually inspected to insure that bussing and terminations have not become loose in transit to job site.
- E. Panelboards shall have main breaker or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting as scheduled on the drawings. Refer to single line diagram and panel schedules on drawings. Terminals shall be minimum 75-degree rated. Back fed main circuit breakers are not allowed. Main circuit breakers shall be vertically mounted.
- F. Panelboards shall have the following features:
1. Non-reduced size copper bus bars, and connection straps bolted together and rigidly supported on molded insulators. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of branch circuit devices.
 2. Full size neutral bar, mounted on insulated supports.
 3. Ground bar and isolation ground bar (where called for in panel schedule) with sufficient terminals for all grounding wires. Buses braced for the available short circuit current.

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4. All breakers and phase bus connections shall be arranged so that it will be possible to substitute a 2-pole breaker for two single-pole breakers, and a 3-pole breaker for three single pole breakers, when trip is 30 amps or less and frame size is 100 amperes or less, without having to drill and tap the main bus bars at bus straps. Where used for heating and air conditioning, and refrigeration equipment, use only HACR type U.L. listed circuit breakers.
 5. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors, and without drilling or tapping.
 6. Where designated on panel schedule as "space," include all necessary bussing, device support and connections. Provide blank cover for each space.
 7. In two section panelboards, the main bus in each section shall be full size. The first section shall be furnished with sub-feed lugs on the line side with cable connections to the second section. Panelboard sections with tapped bus or crossover bus are not acceptable.
 8. Series rated panelboards are not permitted.
 9. Label all panels in accordance with Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS.
 10. Recessed panel space conduit: Provide one 3/4-inch spare conduit stubbed to accessible ceiling space and/or interstitial space below floor for every five spaces and spares indicated on panel schedules.
- G. Panelboards serving as building mains shall be "service entrance rated" and UL Listed as "service equipment."

2.02 CABINETS AND TRIMS

- A. Cabinets:
1. Provide galvanized steel cabinets to house panelboards. Cabinets for outdoor panels shall be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
 2. All ventilated openings in panelboards and switchboards, shall be furnished with dust filters to prevent entrance of dust and debris.
 3. Cabinets for panelboards may be of one piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.
 4. Provide necessary hardware for "in" and "out" adjustment of panel interior.
 5. Cabinets for two section panelboards shall be arranged side by side, and shall be the same height. Flush mounted cabinets should be 1-1/2 inches apart and coupled by conduit nipple if necessary.
 6. Gutter size in panel boxes, on all sides, shall be in accordance with the CEC. Penetrations through gutter to live area of the panelboard shall

SECTION 262416 – PANELBOARDS

incorporate approved non-metallic-grommet type of insulation to protect wire passing through.

B. Trims:

1. Fabricate trim of sheet steel consisting of frame with door attached by concealed hinges. Provide flush or surface trim as shown on the drawings.
2. Flush trims shall overlap the box by at least 3/4-inch all around.
3. Surface trim shall have the same width and height as the box.
4. Flush or surface trims shall not have ventilating openings.
5. Secure trims to back boxes by indicating trim clamps.
6. Provide a welded angle on rear of trim to support and align trim to cabinet.
7. Provide separate trims for each section of multiple section panelboards. Trims and doors of sections shall be of the same height.

C. Doors:

1. Provide doors with flush type latch and manufacturer's standard lock. Doors over 48 inches in height shall have a vault handle and a three-point catch, arranged to fasten door at top, bottom, and center.
2. In making switching devices accessible, doors shall not uncover any live parts.
3. Provide concealed hinges welded to the doors and trims.
4. For lighting or power contactors incorporated in panelboards, provide separate doors for the contactors.
5. Provide keyed alike system for all panelboards.
6. Provide a directory card, metal holder, and transparent cover. Permanently mount holders on inside of doors.

D. Painting:

1. Thoroughly clean and paint trims and doors at the factory with primer and manufacturer's standard finish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with CEC, as shown on the drawings, and as specified.
- B. Locate panelboards so that the present and future conduits can be conveniently connected. Coordinate the sizes and layout of cabinets within the designated spaces. All equipment must be dimensioned in order to physically fit in the spaces provided and to comply with all code required clearances.
- C. Install a typewritten schedule of circuits in each panelboard. Include the room numbers (as finally described by the Owner) and items served on the cards. Obtain final room numbers from Architect prior to creating schedule.

SECTION 262416 – PANELBOARDS

- D. Mount the panelboard so that maximum height of the top circuit breaker above finished floor shall not exceed 78 inches.
- E. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.
- F. Circuit numbers shall correspond to the approved panel schedule. Provide as-built drawings showing the actual circuit numbers being used for each device on each branch circuit if changes are required.
- G. Verify depth of all flush mounted enclosures in walls to be certain wall depth will accommodate panel depth prior to installation.
- H. All openings in switchgear and panelboards that are unused shall be sealed with bolts and washers. Use caulking where holes or openings cannot be sealed by way of a washer, bolts, or conduit seals.
- I. Contractor shall include the services of an independent testing company to test GFI circuit breakers in distribution and main panelboards.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Wiring devices.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
 - 3. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
 - 4. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

PART 2 - PRODUCTS

2.01 RECEPTACLES

- A. General: All receptacles shall be listed by Underwriters Laboratories, Inc. (UL).
 - 1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.

SECTION 262726 – WIRING DEVICES

2. Receptacles shall be of a screw terminal type, “pressure type quick wire” terminations are not allowed.
 3. 15 ampere and 20 ampere, 125-volt and 250-volt non-locking receptacles shall be tamper resistant type receptacles unless the application is specifically listed as an exception to CEC 406.12.
 4. Receptacles shall be “wet rated” when used in an exterior location.
- B. Duplex receptacles shall be Style Line/Decora single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal.
1. Bodies shall be white. Contractor to verify device color with Architect prior to procurement.
 2. Switched duplex receptacles shall be wired so that only the top receptacle is switched. The remaining receptacle shall be unswitched.
 3. Controlled receptacles; installed per requirements of 2019 BUILDING ENERGY EFFICIENCY STANDARDS / Efficiency Standards, California Code of Regulations, Title 24, Part 6. SECTION 130.5 (d) – ELECTRICAL POWER DISTRIBUTION SYSTEMS as Circuit Controls for 120-Volt Receptacles and/or Controlled Receptacles. Shall be provided with an approved means of including a permanent and durable marking identifying the controlled receptacles or circuits to differentiate them from uncontrolled receptacles or circuits. Where shown on associated floor plans, and or required by the Standards; a duplex noted to be controlled shall be 'split-wire,' so the top outlet shall be switched and the bottom outlet shall be unswitched. A double duplex (four-plex) noted to be controlled: one of the duplex receptacles shall be controlled and the other duplex receptacle shall be unswitched.
 4. Duplex Receptacles on Emergency Circuit: Receptacle bodies shall be red in color. Wall plates shall also be powder coat painted red finish. Cover shall be labeled with panel and circuit number.
 5. Ground Fault Interrupter Duplex Receptacles: Shall be an integral unit suitable for mounting in a standard outlet box.
 - a. Ground fault interrupter shall be commercial grade and consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120 volt, 20-ampere branch circuit. Device shall meet CEC requirements. Device shall have a minimum nominal tripping time of 1/30th of a second. Devices shall meet UL 943.
- C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.
- D. Weatherproof Receptacles: Shall consist of a listed weather resistant duplex receptacle, mounted in box with a gasketed, while in use weatherproof, cast metal cover plate and cap receptacle opening. The cap shall be permanently

SECTION 262726 – WIRING DEVICES

attached to the cover plate by a spring-hinged flap. Approved manufacturers: Intermatic WP10 Series, Thomas & Betts/Red Dot 2CK Series, or engineer approved equal.

2.02 SWITCHES AND DIMMERS

- A. Style Line/Decora rocker switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified.
 - 1. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plaster ears and be of a screw terminal type.
 - 2. Shall be color coded for current rating, listed by Underwriters Laboratories, Inc., and meet the requirements of NEMA WD 1, Heavy-Duty and UL 20.
 - 3. Ratings:
 - a. 120 volt circuits: 20 amperes at 120-277 volts AC.
 - 4. The switches shall be mounted on the strike plate side of doors.
 - 5. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
 - 6. All toggle switches shall be of the same manufacturer.
- B. Dimmers: Incandescent lamp loads. Wall-mounted incandescent dimmers shall be specification grade with capability of raising and lowering the lighting from completely off to full intensity. Dimmers shall maintain full load rating even when two or more units are installed adjacent to one another. All wall-mounted dimmers shall be of the same manufacturer and of a “slide” type. Color shall match all other wiring devices on project.

2.03 WALL PLATES

- A. Wall plates for switches and receptacles shall be thermoplastic.
- B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be accordance with NEMA WD1.
- C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.
- D. Wall plates for data, telephone or other communication outlets shall be as specified in the associated specification.
- E. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas all receptacles shall be dust proof and or waterproof where applicable.

SECTION 262726 – WIRING DEVICES

- F. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Switches installed in hazardous areas shall be explosion proof type in accordance with the CEC and as shown on the drawings.
- B. Installation shall be in accordance with the CEC, NECA “Standard of Installation,” and as shown as on the drawings.
- C. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.
- D. General: Devices shall be of the type specified herein. All devices shall be installed with “pigtailed” leads from the outlet box. No device shall be used in the “feed through” application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.
- E. Installation: Devices and plates shall be installed in a “plumb” condition and must be flush with the finish surface of the wall where boxes are recessed.
- F. Mounting heights: All control and convenience devices shall comply with California Code of Regulations Title 24 and ADA with respect to accessibility requirements. Mounting heights indicated on plans shall have precedence.
- G. Install switches with the off position down.
- H. Clean debris from outlet boxes.
- I. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.
- J. Test each receptacle device for proper polarity.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Disconnect and safety switches where shown on the contract drawings and specified herein.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Related Work:
 - 1. Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Approved Manufacturers: Cutler Hammer, General Electric, ITE-Siemens and Square-D.
- B. Disconnect Switches: Provide with devices enabling the switch to be locked in the open or closed positions.
- C. Manual Motor Switches: Tumbler type rated 3 horsepower (HP), 240 volts with or without overload heaters as required to protect equipment served.
- D. Externally Operable Safety Switches: To have quick-make, quick-break mechanism, capable of switching 10 times switch rating, with cover interlock to

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

prevent opening with switch in ON position and defeat mechanism for maintenance.

- E. Switches: Shall be general duty (GD) for 240 volt and below and heavy duty (HD) for 277/480 volt type unless otherwise indicated. Provide National Electrical Manufacturers Association (NEMA) 1 enclosures for interior locations and NEMA 3R enclosures for exterior or wet locations. Provide with number of poles, ampacity, voltage, and HP rating, fusible or non-fusible as indicated. Copper blades shall be visible in off position.
- F. Fusible Switches: Equip them with rejection clips for Underwriter Laboratories (UL) Class R fuses. Switches having a dual rating when used with dual element fuses shall have a rating so indicated and shall be confirmed by equipment vendor being connected.
- G. 600 Amperes or Less Fuses: UL Class RK1 with a minimum interrupting rating of 200,000 Amperes, Bussmann “Low-Peak Type” or equal.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Locations: Install switches, disconnects and safety where indicated on the Contract Drawings or as required by California Electric Code (CEC).
- B. Fastenings: Securely fasten switches to structural members or unistrut support as directed by the manufacturer.
- C. Manual Motor Switches: Install flush mounted in finished areas.
- D. Manual Motor Switches: Install surface mounted in equipment rooms and non-finished areas. Where installed above inaccessible ceilings provide access panels.
- E. Label all disconnect switches in accordance with Section 260553, IDENTIFICATION OF ELECTRICAL SYSTEMS.
- F. Fuse: All fuses shall be as indicated on the plan or as required by the equipment. Verify fuse size with equipment manufacturer requirements, prior to installation. Use current limiting fuses as indicated on plan. Provide one spare fuse cabinet in each electrical room with one complete set of spare fuses for all sizes of main fuses; subpanel fuses; HVAC equipment fuses and fire alarm.
- G. Terminals shall be minimum 75-degree rated.

END OF SECTION

SECTION 263213

EMERGENCY GENERATOR SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Applicable Codes and Standards:
 - 1. 2019 California Building Code (CBC).
 - 2. 2019 California Mechanical Code (CMC).
 - 3. 2019 California Electrical Code (CEC). Specifically, CEC Articles 517, 700, 701, 702.
 - 4. 2019 California Fire Code (CFC) only if 12-foot vent pipe required.
 - 5. 2019 NFPA 30 – Flammable and Combustible Liquids Code.
 - 6. 2019 NFPA 37 – Installation and Use of Stationary Combustion Engines.
 - 7. 2019 NFPA 55 – Compressed Gases and Cryogenic Fluids Code.
 - 8. 2019 NFPA 110 – Emergency and Standby Power Systems (2016 NFPA 110 (Testing)).
 - 9. UL 2200 – Standard for Safety of Stationary Engine Generator Assemblies.
 - 10. U.S. EPA – New Source Performance Standards.
 - 11. International Standards Organization, ISO 9001.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. An electric generating system or Emergency Power Supply (EPS), consisting of a prime mover, generator, governor, coupling and controls, must have been tested, as a complete unit, on a representative engineering prototype model of the equipment to be sold.
- B. The generator set must conform to applicable California Electrical Code and applicable authorities having jurisdiction including DSA and CSFM.
- C. The generator set must be available with the Underwriters Laboratories (UL) listing (UL 2200) as a stationary engine generator assembly.
- D. The generator shall meet all of the following standards: The generator set shall be EPA and CARB Emissions Certified for non-road applications and meet all

SECTION 263213 – EMERGENCY GENERATOR SYSTEM

local emission standards and requirements. It shall meet all local County or Regional APCD requirements.

- E. The generator control and remote annunciation shall be compatible with the transfer microprocessor based logic controller integrated in the main switchboard. The transfer controller shall communicate through open protocol to energy management system or data network to provide remote status indication.

1.03 MANUFACTURER QUALIFICATIONS

- A. This system shall be supplied by Cummins or engineer approved equal, who has been regularly engaged in the production of engine-alternator sets and associated controls for a minimum of 20 years, thereby identifying one source of supply and responsibility.
- B. To be classified as a manufacturer, the builder of the generator set must manufacture, at minimum, engines or alternators.
- C. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.
- D. Substitutions: The emergency power system has been designed to the specified manufacturer's electrical and physical characteristics. The equipment sizing, spacing, amounts, electrical wiring, ventilation equipment, fuel and exhaust components have all been sized and designed around equipment. Should any substitutions be made, the contractor shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs which may result from such substitutions. Alternate equipment suppliers shall follow all submittal requirements outlined in the general conditions as part of the submittals, the substitute manufacturer shall supply as a minimum engine, alternator and control panel wiring diagrams and schematics. A separate list of all printed circuit boards with part numbers and current pricing must also be included.
- E. Manufacturer shall provide certification that the equipment supplied under this Section has been reviewed and certified to meet the current criteria for special seismic certification. Include seismic companion anchorage requirements from the testing and as approved by the manufacturer.

1.04 UNIT TESTING

- A. Before shipment of the equipment, the engine-generator set shall be tested under rated load and rated power factor for performance and proper functioning of control and interfacing circuits. Tests shall include:
 - 1. Verifying all safety shutdowns are functioning properly.

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2. Verify single step load pick-up per NFPA 110, paragraph 7.13.7.
3. Verify transient and voltage dip responses and steady state voltage and speed (frequency) checks.
4. Submit the certification of the factory test, including recorded ambient temperature, altitude, and fuel grade.

1.05 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Owner's Manuals: provide three sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.
- C. Submittals: Provide complete sets of Engineering Submittal for approval, prior to production release, showing all components, in addition to the engine and generator. Submittals shall include compliance with these specifications. Refer to general requirements for quantities of submittals and additional requirements.

1.06 WARRANTY

- A. Warranty: The standby electric generating system components, complete engine-generator and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of 5 years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge. Travel and labor shall be included for the first 36 months. The warranty period shall commence when the standby power system is placed into service and accepted by the Owner or Owner's Representative. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying engineer, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

1.07 SERVICE CONTACT

- A. Service: Supplier of the electric plant and associated items shall have permanent service facilities in this trade area. These facilities shall comprise a permanent force of factory trained service personnel on 24-hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be

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considered fulfillment of these specifications. Service contracts shall also be available.

PART 2 - PRODUCT

2.01 ENGINE

- A. The prime mover shall be a liquid cooled, diesel fueled, naturally aspirated engine of 4-cycle design with a minimum of six cylinders. The unit requires a minimum rated output of per single line diagram at an operating speed of 1800 RPM.
- B. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system providing visual diagnostic means to determine if the system is operating with a normal engine coolant level. The radiator shall be designed for operation in 110 deg F, 43 deg C ambient temperature.
- C. The intake air filter(s) with replaceable element must be mounted on the unit. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s). Engine coolant and oil drain extensions, equipped with pipe plugs, must be provided to outside of the mounting base for cleaner and more convenient engine servicing. A fan guard must be installed for personnel safety.
- D. The engine shall have a battery charging DC alternator with a transistorized voltage regulator. Remote 2-wire starting shall be by a solenoid shift, electric starter.
- E. Engine speed shall be controlled by isochronous governor to maintain alternator steady state frequency within 0.25 percent from no load to full load alternator output. Steady state regulation is to be 0.5 percent.
- F. The engine fuel system shall be designed for operation using No. 2 diesel fuel. A primary fuel filter, water separator, manual fuel priming pump, fuel shutoff solenoid and all fuel lines must be installed at the point of manufacture.
- G. The primary diesel fuel filter shall be capable of removing contaminants of 10 microns. Element shall be replaceable paper type.
- H. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer. The contractor shall provide proper branch circuit from normal utility power source.

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- I. Sensing elements to be located on the engine for low oil pressure shutdown, high engine temperature shutdown, low coolant level shutdown, overspeed shutdown, overcrank shutdown, remote E-stop shutdown and air shutdown damper when used. These sensors are to be connected to the control panel using a wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on each sensor to prevent corrosion and all wiring to be run in flexible conduit for protection from the environment and any moving objects.
- J. Provide the following items installed at the factory:
 1. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system.
 2. The fuel system shall include a 48-hour, double wall base mounted fuel tank. It shall have a stub-up area convenient for electrical conduit entry. It shall have the structural integrity to support the engine-generator set and carry the UL 142 mark. Minimum features shall include all welded construction, a lockable fuel filler cap, fuel gauge, low fuel level alarm, fuel line check valve, vent and fittings for fuel supply, return, fill and emergency vent. This tank must be supplied by the engine-generator set manufacturer and be installed before shipment.
 3. Supply the base tank with normal venting and emergency relief venting per NFPA 30.

2.02 ALTERNATOR

- A. The alternator shall be a 4-pole revolving field type, 12-lead, wired for 120/208vac 3-phase 4-wire, 60-hz, with a brushless exciter. Photosensitive components will not be permitted in the rotating exciter. The stator shall be direct connected to the engine to insure permanent alignment. The generator shall meet temperature rise standards for Class "H" insulation; operate within Class "F" standards for extended life. All leads must be extended into an AC connection panel. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.
- B. One step load acceptance shall be 100 percent of engine-generator set nameplate rating and meet the requirements of NFPA 110 Paragraph 7.13.7. The generator set and regulator must sustain at least 90 percent of rated voltage for 10 seconds with 250 percent of rated load at near zero power factor connected to its terminals when equipped with direct or brushless excitation. 300 percent short circuit current must be selectable on units equipped with permanent magnet exciters. Generators equipped with permanent magnet exciters not allowing the selection of the short circuit current ratings are not allowed.

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- C. A solid state voltage regulator designed and built by the alternator manufacturer must be used to control output voltage by varying the exciter magnetic field to provide + or - 1 percent regulation during stable load conditions. Should an extremely heavy load drop the output frequency, the regulator shall have a voltage drop of 4 volts/hertz to maximize motor starting capability. The frequency at which this droop operation begins must be adjustable, allowing the generator set to be properly matched to the load characteristics insuring optimum system performance. Additional rheostats for matching generator voltage, droop, and stability characteristics to the specific load conditions must be available.
- D. A NEMA 1 panel that is an integral part of the generator set must be provided to allow the installer a convenient location in which to make electrical output connections. A fully rated, isolated neutral must be included by the generator set manufacturer to insure proper sizing.
- E. The electric plant shall be mounted with vibration isolators on a welded steel base that shall permit suitable mounting to any level surface.
- F. Provide the following items installed at the factory:
 - 1. A main line molded case type, generator mounted circuit breaker carrying the UL mark shall be factory installed per single line diagram. The breaker shall be rated per the manufacturer's recommendations. Circuit breaker shall be mounted in the genset connection box. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections. A system utilizing manual reset field circuit breakers and current transformers is unacceptable

2.03 CONTROLS

- A. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock mounted in a NEMA 1 enclosure to the engine-generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/-5 percent voltage adjusting control. This panel must be able to be rotated 90 degrees in either direction for correct installation.
- B. The engine-generator set shall contain a complete 2-wire automatic engine start-stop control which starts the engine on closing contacts and stop the engine on opening contacts. A cyclic cranking limiter shall be provided to open the starting circuit after eight attempts if the engine has not started within that time. Engine control modules must be solid state plug-in type for high reliability and easy service.
- C. The panel shall include; analog meters to monitor AC voltage, AC current and AC frequency with a phase selector switch, an emergency stop switch, an

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audible alarm, battery charger fuse, and a programmable engine control and monitoring module.

- D. The programmable module shall include: a manual, off, auto switch; four LEDs to indicate: 1) Not In Auto, 2) Alarm Active, 3) Generator Running, 4) Generator Ready; a data entry keypad and a digital display panel.
- E. The module will display all pertinent unit parameters including:
 - 1. Generator Status:
 - a. Current unit status in real time.
 - 2. Instrumentation:
 - a. Real time readouts of the engine and alternator analog values:
 - 1) Oil pressure.
 - 2) Coolant temperature.
 - 3) Fuel level.
 - 4) DC battery voltage.
 - 5) Run time hours.
 - 3. Generator Commands:
 - a. Current engine start/stop status.
 - 4. Alarm Status (Safety Indications and Shutdowns as required by NFPA 110:Table 5.6.5.2 for the level of EPS being installed):
 - a. Current alarm(s) condition.

LEVEL 1 SYSTEM	(NFPA 99 T6.4.1.1.16.2 ref. designation)
1) Overcrank	(a)
2) Low water temperature	(b)
3) High engine temperature pre-alarm	(c)
4) High engine temperature	(d)
5) Low oil pressure pre-alarm	(e)
6) Low oil pressure	(f)
7) Overspeed	(g)
8) Low fuel level main tank	(h)
9) Low coolant level	(i)
10) EPS supplying load	(j)
11) Unit not in "Automatic Mode"	(k)
12) High battery voltage	(l)
13) Low cranking voltage	(m)
14) Low battery voltage	(n)
15) Battery charger AC failure	(o)
16) Lamp test	(p)
17) Contacts for local and remote common alarm	(q)
18) Audible alarm silencing switch	(r)
19) Low starting air pressure (when applicable)	(s)
20) Low starting hydraulic pressure (when applicable)	(t)
21) Air shutdown damper when used	(u)
22) Remote Emergency Stop	(v)

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- 23) High or low AC voltage (-)
 - 24) High or low frequency (-)
 - 25) High, low and critical low fuel levels (-)
 - 26) *8 user programmable digital channels (-)
 - 27) *4 user programmable analog channels (-)
- 5. Alarm Log:
 - a. Memory of last fifty alarm events.
 - 6. Operating parameters:
 - a. Access to and manipulation of the current operating parameters and alarm limits.
 - 7. Software Information.
 - a. Version information and module display test function.
- F. The panel must be accessible by PC based software via either standard RS232, RS485 or modem. The software must display the module face, be updated in real time and allow for complete access to all module functions. Communication output and its software must be fully compatible and allow for incorporation in the system control program.
- G. The following equipment is to be installed at the engine-generator set manufacturer's facility:
- 1. A DPDT relay shall be socket mounted in the generator control panel and operate on engine start and run for customer connection.
- H. The following equipment is to be provided by the engine-generator set manufacturer and shipped loose with the unit:
- 1. A (20) light remote annunciator panel flush mounted where shown on drawings.
 - 2. A weather proof tamper resistant remote emergency power off (EPO/E-Stop) mushroom type push button labeled "Generator Emergency Stop."

2.04 UNIT ACCESSORIES

- A. The following equipment is to be installed at the engine-generator set manufacturer's facility:
- 1. The exhaust silencer(s) shall be provided of the size as recommended by the manufacturer and shall be of critical grade. It shall be connected to the engine with a flexible, seamless, stainless steel exhaust connection. A rain cap will terminate the exhaust pipe. All components must be properly sized to assure operation without excessive back pressure when installed. Enclosure shall have an externally mounted emergency stop button.
 - 2. A heavy duty, lead acid battery set rated at 90AH (27F) shall be installed by the generator set manufacturer. Provide all intercell and connecting battery cables as required.
 - 3. Provide a 2-amp automatic float battery charger manufactured by the engine-generator set supplier. It is to be of a solid state design and self-

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regulating to prevent overcharging the system battery. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

- B. The following equipment is to be provided by the engine-generator set manufacturer and shipped loose with the unit:
 - 1. Spring type vibration isolators to mount between the mounting base and pad to reduce noise and transmitted vibrations shall be supplied by the manufacturer.
 - 2. Pad type vibration dampeners.
 - 3. Normal fuel venting kit to minimum 12 feet above grade, in compliance with CFC 3404.2.7.3.3.
- C. Provide with Diesel Particulate Filer (DPF).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall install the complete electrical generating system including the indicated shipped-loose accessories and all fuel connections in accordance with the manufacturer's recommendations as reviewed by the Engineer.
- B. Contractor shall provide complete conduit infrastructure for power and low voltage/communications wiring to generator system and all accessories.

3.02 STARTUP AND CHECKOUT

- A. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:
 - 1. Provide all required fluids (oil, coolant, lubricants, and fuel) and ancillary equipment for full function of the Emergency Power Supply.
 - 2. Ensuring the engine starts (both hot and cold) within the specified time.
 - 3. Verification of engine parameters within specification.
 - 4. Verify no load frequency and voltage, adjusting if required.
 - 5. Test all automatic shutdowns of the engine-generator.
 - 6. Perform a 4-hour load test of the electric plant, per NFPA 110 Section 7.13. Observe and record results of test in the presence of the AHJ / IOR. Provide a portable load bank, cables and connections as required to conform to testing requirements. Correct defects which become evident during this test. Supply fuel for test. Include the complete emergency system (consisting of generator, emergency distribution equipment and

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automatic transfer switches, and the like) in final test operations. Top off fuel tank at end of test.

7. Include 4-hour on-site meeting / training with Owner's representative prior to final acceptance. Schedule training with Owner (minimum) 1 week in advance by mutual agreement of Owner and manufacturers' representative.

END OF SECTION

SECTION 263623

AUTOMATIC TRANSFER AND BYPASS-ISOLATION SWITCHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. Furnish and install automatic delayed transition transfer and bypass-isolation switch (DTTS/BPS) with number of poles, amperage, and voltage ratings as shown on the plans. Rate the automatic transfer switch to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals. Each DTTS/BPS system(s) shall consist of a delayed transition transfer switch and a two-way bypass/isolation switch. All DTTS/BPSs and control modules shall be the product of the same manufacturer.
 - 2. The DTTS/BPS shall transfer the load in delayed transition (break-before-make) mode. Transfer is accomplished with a user-defined interruption period in both directions adjustable from 1 second to 5 minutes in at least 15 increments.

1.03 CODES AND STANDARDS

- A. The automatic delayed transition transfer and bypass-isolation switches and accessories shall conform to the requirements of:
 - 1. UL 1008 - Standard for Transfer Switch Equipment.
 - 2. IEC 947-6-1 – Low-voltage Switchgear and Control Gear; Multifunction equipment; Automatic Transfer Switching Equipment.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 99 – Essential Electrical Systems for Health Care Facilities.
 - 5. NFPA 110 - Emergency and Standby Power Systems.
 - 6. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
 - 7. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches.

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8. UL 508 Industrial Control Equipment.

1.04 SUBMITTALS, OPERATOR'S MANUAL, AND WARRANTY

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Include three copies of specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams; dimension drawings; and interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these Specifications.
- C. Manufacturer shall provide certification that the equipment supplied under this Section has been reviewed and certified for special seismic certification. Include seismic companion anchorage requirements from the testing and as approved by the manufacturer. The manufacturer shall provide an approved label on the equipment enclosure stating that the equipment has been awarded a certificate of compliance for special seismic certification.
- D. Provide transfer switch with three copies of the operator's manual providing installation and operating instructions.
- E. Each automatic transfer switch set warranted by manufacturer for 1 year from date placed in service.

1.05 ACCEPTABLE MANUFACTURERS

- A. Manufacturer regularly engaged in the production of this type of equipment and one that has a local distributor and service organization.
- B. Automatic delayed transition transfer and bypass-isolation switches shall be ASCO Series 7000. Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Alternate bids must list any deviation from this specification.

PART 2 - PRODUCTS

2.01 MECHANICALLY HELD TRANSFER SWITCH

- A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a solenoid mechanism, momentarily energized. The transfer switch unit shall include both electrical and mechanical interlocks to prevent both sets of main contacts from being closed at the same time. Main

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operators which include overcurrent disconnect devices OR do not include electrical and mechanical interlocks will not be accepted.

- B. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
- C. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- D. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
- E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 600 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
- F. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- G. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

2.02 BYPASS-ISOLATION SWITCH

- A. A two-way bypass-isolation switch shall provide manual bypass of the load to either source and permit isolation of the automatic transfer switch from all source and load power conductors. All main contacts shall be manually driven.
- B. Power interconnections shall be silver-plated copper bus bar. The only field installed power connections shall be at the service and load terminals of the bypass-isolation switch. All control interwiring shall be provided with disconnect plugs.
- C. Separate bypass and isolation handles shall be utilized to provide clear distinction between the functions. Handles shall be permanently affixed and operable without opening the enclosure door. Designs requiring insertion of loose operating handles or opening of the enclosure door to operate are not acceptable.
- D. Bypass to the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). Designs which disconnect the

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load when bypassing are not acceptable. The bypass handle shall have three operating modes: “Bypass to Normal,” “Automatic,” and “Bypass to Emergency.” The operating speed of the bypass contacts shall be the same as the associated transfer switch and shall be independent of the speed at which the manual handle is operated. In the “Automatic” mode, the bypass contacts shall be out of the power circuit so that they will not be subjected to fault currents to which the system may be subjected.

- E. The isolation handle shall provide three operating modes: “Closed,” “Test,” and “Open.” The “Test” mode shall permit testing of the entire emergency power system, including the automatic transfer switches with no interruption of power to the load. The “Open” mode shall completely isolate the automatic transfer switch from all source and load power conductors. When in the “Open” mode, it shall be possible to completely withdraw the automatic transfer switch for inspection or maintenance to conform to code requirements without removal of power conductors or the use of any tools.
- F. When the isolation switch is in the “Test” or “Open” mode, the bypass switch shall function as a manual transfer switch.
- G. Designs requiring operation of key interlocks for bypass isolation or ATSS which cannot be completely withdrawn when isolated are not acceptable.

2.03 MICROPROCESSOR CONTROLLER

- A. The controller’s sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.
- B. A single controller shall provide twelve selectable nominal voltages for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1 percent of nominal voltage. Frequency sensing shall be accurate to ± 0.2 percent. The panel shall be capable of operating over a temperature range of -20 to +60 deg C and storage from -55 to +85 deg C.
- C. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator’s manuals.

SECTION 263623 – AUTOMATIC TRANSFER AND BYPASS-ISOLATION SWITCHES

- D. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.
- E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 - 1. EN 55011:1991 Emission standard - Group 1, Class A.
 - 2. EN 50082-2:1995 Generic immunity standard, from which:
 - a. EN 61000-4-2:1995 – Electrostatic discharge (ESD) immunity.
 - b. ENV 50140:1993 – Radiated Electro-Magnetic field immunity.
 - c. EN 61000-4-4:1995 – Electrical fast transient (EFT) immunity.
 - d. EN 61000-4-5:1995 – Surge transient immunity.
 - e. EN 61000-4-6:1996 – Conducted Radio-Frequency field immunity.
 - 3. IEEE472 (ANSI C37.90A) Ring Wave Test.

2.04 ENCLOSURE

- A. The DTTS/BPS shall be furnished in a Type 1 enclosure unless otherwise shown on the plans.
- B. All standard and optional door-mounted switches and pilot lights shall be 16-mm industrial grade type or equivalent for easy viewing and replacement. Door controls shall be provided on a separate removable plate, which can be supplied loose for open type units.

2.05 CONTROLLER DISPLAY AND KEYPAD

- A. A 4-line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller:
 - 1. Nominal line voltage and frequency.
 - 2. Single or three phase sensing.
 - 3. Operating parameter protection.
 - 4. Transfer operating mode configuration (Open transition, Closed transition or Delayed transition).
- B. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

2.06 VOLTAGE, FREQUENCY, AND PHASE ROTATION SENSING

- A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout and

**SECTION 263623 – AUTOMATIC TRANSFER AND
BYPASS-ISOLATION SWITCHES**

trip setting capabilities (values shown as percent of nominal unless otherwise specified):

<u>Parameter</u>	<u>Sources</u>	<u>Dropout / Trip</u>	<u>Pickup / Reset</u>
Undervoltage	N&E,3 ϕ	70 to 98%	85 to 100%
Overvoltage	N&E,3 ϕ	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

- B. Repetitive accuracy of all settings shall be within \pm 0.5 percent over an operating temperature range of -20 deg C to 60 deg C.
- C. Voltage and frequency settings shall be field adjustable in 1 percent increments either locally with the display and keypad or remotely via serial communications port access.
- D. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).
- E. Source status screens shall be provided for both normal and emergency to provide digital readout of voltage on all three phases, frequency and phase rotation.

2.07 TIME DELAYS

- A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.
- B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
- C. An adjustable time delay of 0 to 6 seconds to override momentary emergency source outage to delay all retransfer signals during initial loading of engine generator set.
- D. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One-time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

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- E. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
- F. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0- to 5-minute time delay in any of the following modes:
 - 1. Prior to transfer only.
 - 2. Prior to and after transfer.
 - 3. Normal to emergency only.
 - 4. Emergency to normal only.
 - 5. Normal to emergency and emergency to normal.
 - 6. All transfer conditions or only when both sources are available.
- G. The controller shall also include the following built-in time delays for Delayed Transition and Bypass-Isolation operation:
 - 1. 0 to 5 minute time delay for the load disconnect position for delayed transition operation.
- H. All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in 0.01 second increments.
- I. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port. The time delay value displayed on the LCD or remote device shall be the remaining time until the next event occurs.

2.08 ADDITIONAL FEATURES

- A. A three-position momentary-type test switch shall be provided for the test/automatic/reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal. Switches which require utilizing the keypad and display function or have no manual time delay bypass means are not acceptable.
- B. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the DTTS is connected to the normal source and one contact closed, when the DTTS is connected to the emergency source.

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- D. LED indicating lights (16 mm industrial grade, type 12) shall be provided; one to indicate when the DTTS is connected to the normal source (green) and one to indicate when the DTTS is connected to the emergency source (red).
- E. LED indicating lights (16 mm industrial grade, type 12) shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.
- F. The following features shall be built-in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:
1. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
 2. Terminals shall be provided for a remote contact which opens to signal the DTTS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or serial port.
 3. The controller shall be capable of accepting a normally open contact that will allow the transfer switch to function in a non-automatic mode using an external control device.
 4. Engine Exerciser – The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to seven different exercise routines. For each routine, the user shall be able to:
 - a. Enable or disable the routine.
 - b. Enable or disable transfer of the load during routine.
 - c. Set the start time:
 - 1) time of day.
 - 2) day of week.
 - 3) week of month (1st, 2nd, 3rd, 4th, alternate or every).
 - d. Set the duration of the run.
- G. At the end of the specified duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. A 10-year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information.
- H. System Status - The controller LCD display shall include a “System Status” screen which shall be readily accessible from any point in the menu by depressing the “ESC” key a maximum of two times. This screen shall display a clear description of the active operating sequence and switch position. For example,

Normal Failed
Load on Normal

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TD Normal to Emerg
2 min 15 sec

- I. Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual, are not permissible.
- J. Self Diagnostics. The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- K. Communications Interface. The controller shall be capable of interfacing, through an optional serial communication module, with a network of transfer switches, locally (up to 4,000 feet) or remotely through modem serial communications. Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control and setup of parameters.
- L. Data Logging. The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:
 - 1. Event Logging:
 - a. Date and time and reason for transfer normal to emergency.
 - b. Date and time and reason for transfer emergency to normal.
 - c. Date and time and reason for engine start.
 - d. Date and time engine stopped.
 - e. Date and time emergency source available.
 - f. Date and time emergency source not available.
 - 2. Statistical Data:
 - a. Total number of transfers.
 - b. Total number of transfers due to source failure.
 - c. Total number of days controller is energized.
 - d. Total number of hours both normal and emergency sources are available.
- M. Communications Module. A full duplex RS485 interface shall be installed in the DTTS controller to enable serial communications. The serial communications shall be capable of a direct connect or multi-drop configured network. This module shall allow for the seamless integration of existing or new communication transfer devices. The serial communication interface shall be equal to ASCO Accessory 72.

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2.09 WITHSTAND AND CLOSING RATINGS

- A. The DTTS/BPS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the DTTS/BPS terminals with the type of overcurrent protection provided.
- B. The DTTS/BPS shall be UL listed in accordance with UL 1008 and be labeled in accordance with that standard's 1-1/2- and 3-cycle, long-time ratings. DTTS/BPSs which are not tested and labeled with 1-1/2- and 3-cycle (any breaker) ratings and have series, or specific breaker ratings only, are not acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide wiring within transfer switches in accordance to NFPA-76A and NEC requirements.
- B. Install and connect the automatic transfer switches components of essential electrical system so that within 10 seconds of a power supply drop in the utility company's normal service, the generator starts and automatically transfer loads to the generator source.
- C. Installation is in accordance with all local, state and federal codes. Verify code requirements as associated with engine generator, transfer switch, fuel storage and transfer prior to installation.

3.02 TESTS AND CERTIFICATION

- A. The complete DTTS/BPS shall be factory tested to ensure proper operation of the individual time, voltage, frequency and time delay settings are in compliance with the specification requirements. Subject the complete automatic transfer switch to a dielectric strength test per NEMA ICS 1-109.05.
- B. Incorporate the transfer switches into final system test.
- C. Include the complete emergency system, consisting of generator, emergency distribution equipment and automatic transfer switches in all final test operations.
- D. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment

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involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

- E. The DTTS/BPS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.components and correct overall sequence of operation and to ensure that the operating transfer.

3.03 SERVICE REPRESENTATION

- A. The DTTS/BPS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
1. Interior lighting systems, including luminaires, ballasts, lamps, and emergency lighting equipment.
- B. Related Work:
1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low voltage power and lighting wiring.
 3. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.
 4. Section 265670, LIGHTING ACCEPTANCE TESTING.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Shop Drawings:
1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 2. Include electrical ratings, dimensions, mounting, details, materials, terminations, wiring and connection diagrams, photometric data, ballasts, luminaires, lamps and controls.

SECTION 265100 – INTERIOR LIGHTING

1.04 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM).
- C. American National Standards Institute (ANSI).
- D. Aluminum Association Inc. (AA).
- E. Illuminating Engineering Society of North America (IESNA).
- F. National Electrical Manufacturers Association (NEMA).
- G. National Fire Protection Association (NFPA).
- H. Underwriters Laboratories, Inc. (UL).

1.05 DEFINITIONS

- A. Lighting terminology used herein is defined in IES.
- B. Exception: The term “driver” is used herein to cover both drivers and power supplies, where applicable.
- C. Clarification: The term “LED light source(s)” is used herein per IES to cover LED package(s), module(s), and array(s).

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be in accordance with CEC, UL, ANSI, and as shown on the drawings and specified.

2.02 LIGHTING FIXTURES (LUMINAIRES)

- A. Shall be in accordance with NFPA 70, UL 1598 and shall be as shown on drawings and as specified. All luminaires shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code of Regulations Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.

SECTION 265100 – INTERIOR LIGHTING

- B. Sheet Metal:
1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
 2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
 3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.
 4. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools.
- C. Ballasts shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers.
- D. Recessed fixtures shall be of the type approved for the ceiling and insulation conditions and appropriate for the installation location. Insulation must be held back from the fixture to provide manufacturers' recommended clearances for proper operation. Thermal tripping shall be the installer's responsibility to correct. Where installed in fire rated ceilings, coordinate installation of fire rated enclosures around the ceiling penetrations. Fixtures shall contain the proper through wiring capacity for that which is shown on the plans.
- E. Recessed fixtures shall be provided with the appropriate trims and hardware compatible with the ceiling type shown. Plaster frames are required where plaster or gypsum board ceilings are encountered.
- F. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- G. Metal Finishes:
1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking.
 2. Interior light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise specified on the drawing.
 3. Exterior finishes shall be as shown on the drawings.

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- H. Provide all lighting fixtures with a specific means for grounding metallic wireways and housings to an equipment grounding conductor.
- I. Recessed LED fixtures shall be manufactured specifically for compact fluorescent or LED lamps with ballasts or drivers integral to the fixture. Assemblies designed to retrofit fixtures are prohibited except when described in this fashion. Fixtures shall be designed for lamps as specified.
- J. Provide wire lamp guard on all exposed lamp fixture/luminaires.
- K. Provide fixtures with a UL listing for shower or shower rating above shower or tub areas.

2.03 LED LUMINAIRE REQUIREMENTS

- A. General Requirements:
 - 1. Luminaire shall have an external label per ANSI C136.15.
 - 2. Luminaire shall have an internal label per ANSI C136.22.
 - 3. Luminaires shall start and operate in -20 deg C to +40 deg C ambient.
 - 4. LED light source(s) and driver(s) shall be RoHS compliant.
- B. Manufacturer: Advance Optanium “LW” Series, Sylvania Octron “XTREME” Series, Universal Triad “EL” Series.
- C. All ballasts shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code or Regulation Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.
- D. Performance: Ballasts shall carry a minimum full 5 year warranty. All ballasts shall have a Class A sound rating. Any ballast deemed noisy by the Architect shall be replaced at no charge to the Owner.
- E. Shielding: All lens material shall be 100% virgin acrylic, .125” minimum thickness, unless otherwise indicated in the fixture schedule. Diffusers shall comply with UBC 5209.
- F. Slimline and magnetic ballasts shall not be allowed.

2.04 LED DRIVER

- A. Driver
 - 1. Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperatures as indicated.

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2. Shall accept the voltage or voltage range indicated, and shall operate normally for input voltage fluctuations of plus or minus 10 percent. Consistent with NEMA SSL 1.
 3. Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- B. Electromagnetic interference
1. Shall have a maximum Total Harmonic Distortion (THD) of 20 percent at full input power and across specified voltage range.
 2. Shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- C. The following shall be in accordance with corresponding sections of ANSI C136.37:
1. Wiring and grounding.
 2. All internal components shall be assembled and pre-wired using modular electrical connections.
 3. Mounting provisions.
 4. Terminal blocks for incoming AC lines.
 5. Latching and hinging.
 6. Ingress protection.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation and furnishing of lighting fixtures shall be in accordance with the CEC, manufacturer's instructions and as shown on the drawings or specified. Fixtures damaged in transit and storage prior to completion shall be replaced at Contractor's expense.
- B. Align, mount, and level the lighting fixtures uniformly.
- C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Architect. The Architectural reflected ceiling plan will take precedence over electrical plans.
- D. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.
- E. Lighting Fixture Supports:
1. Contractor shall provide support for all of the fixtures independent of suspended ceilings. Supports may be anchored to channels of the ceiling

SECTION 265100 – INTERIOR LIGHTING

- construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and relamping.
 3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 4. Hardware for recessed fluorescent fixtures:
 5. Fixtures shall be supported as detailed on drawings and as required by DSA standards.
 6. Installation: Fixtures shall be securely mounted on ceilings and walls with appropriate fastening devices. "Drop-in" type T-bar fixtures shall be secured with #12 gauge safety "earthquake wires" as described by California Code of Regulations Title 24 Part 2, Chapter 47. "Earthquake clips" will be required for fastening to the T-bar system in addition to safety wire. Surface mounted fluorescent fixtures shall be solidly screwed or clipped into framing above drywall with 4-#10 sheet metal screws into each fixture. Provide blocking for screw supports behind all surface mounted lighting fixtures weighing more than 15 lbs.
 7. Surface mounted lighting fixtures:
 8. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts shall be minimum 1/4-20 bolt, secured to structural ceiling. Non-turning studs may be attached to the building structure by 12 gauge safety hangers.
 9. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.
 10. Single or double pendent mounted lighting fixtures:
 11. Each stem shall be supported by an approved outlet box, mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure and be allowed to swing to a 45 degree angle.
 12. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger, and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.
- F. Furnish and install the specified lamps for all lighting fixtures as part of this project.
- G. Coordinate between the electrical and ceiling trades to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.
- H. Bond lighting fixtures and metal accessories to the grounding system.

SECTION 265100 – INTERIOR LIGHTING

- I. At completion of project, relamp all fixtures which have failed/burned-out lamps. Clean all fixtures, lenses, diffusers, and louvers that have accumulated dust/dirt during construction.
- J. Provide unswitched leg of interior lighting branch circuit to integral emergency battery pack light fixtures, exit signs and night lights as applicable per lighting plans.
- K. Wall-mount fixtures in walkway areas shall not project more than 4 inches from wall when projection occurs lower than 80 inches.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of exterior luminaires, controls, poles, and supports.

1.02 RELATED WORK

- A. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.
- C. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low voltage power and lighting wiring.
- D. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- E. Section 260546.13, ELECTRIC UTILITY SYSTEMS: Underground handholes and conduits.
- F. Section 265100, INTERIOR LIGHTING.
- G. Section 265670, LIGHTING ACCEPTANCE TESTING.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, poles, luminaires, effective projected area (EPA), lamps and controls.

SECTION 265600 – EXTERIOR LIGHTING

1.04 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM).
- C. American Concrete Institute (ACI).
- D. American National Standards Institute (ANSI).
- E. Aluminum Association Inc. (AA).
- F. Illuminating Engineering Society of North America (IESNA).
- G. National Electrical Manufacturers Association (NEMA).
- H. National Fire Protection Association (NFPA).
- I. Underwriters Laboratories, Inc. (UL).

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Poles: Do not store poles on ground. Store poles so they are at least one foot above ground level. Do not remove factory-applied pole wrappings until just prior to installation of pole.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be in accordance with CEC, UL, ANSI, as shown on the drawings and as specified.

2.02 POLES

- A. General:
 - 1. Poles shall be steel or aluminum as specified in fixture schedule and as shown on the drawings. Finish shall be as approved by the Architect. Assume custom color for bidding.
 - 2. The pole and arm assembly shall be designed for wind loading of 100 miles per hour, with an additional 30 percent gust factor, supporting luminaire(s) having the effective projected areas indicated as per manufacturer data.

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3. Poles shall anchor-bolt type designed for use with underground supply conductors. Poles shall have gasketed handhole with a minimum clear opening of 2.5 inches x 5 inches. Handhole cover shall be secured by stainless steel captive screws.
 4. Provide a steel grounding stud opposite handhole openings.
- B. Provide a base cover matching the pole in material and color to conceal the mounting hardware pole-base welds and anchor bolts.
- C. Hardware: All necessary hardware shall be 300 series tamperproof stainless steel.
- D. Types:
1. Aluminum: Provide aluminum poles manufactured of corrosion resistant AA AAH35.1 aluminum alloys conforming to AASHTO LTS-4 for Alloy 6063-T6 or Alloy 6005-T5 for wrought alloys, and Alloy 356-T4 (3,5) for ASTM B108-01 cast alloys. Poles shall be seamless extruded or spun seamless type. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire. Base covers for aluminum poles shall be cast from 356-T6 aluminum alloy in accordance with ASTM B108-01.
 2. Steel: Provide steel poles having minimum 11-gage steel with minimum yield/strength of 48,000 psi and iron-oxide primed factory finish. Base covers for steel poles shall be structural quality hot-rolled carbon steel plate having a minimum yield of 36,000 psi.

2.03 FOUNDATIONS FOR POLES

- A. Foundations shall be cast-in-place concrete.
- B. Foundations shall support the effective projected area of the specified pole, arm(s), luminaire(s), and all accessories specified under wind conditions as specified in this section.
- C. Place concrete in spirally wrapped treated paper forms for round foundations, and construct forms for square foundations.
- D. Rub-finish and round all above-grade concrete edges to approximately 1/4-inch radius unless otherwise detailed.
- E. Concrete shall have 3,000 psi minimum 28-day compressive strength.
- F. Anchor bolt assemblies and reinforcing of concrete foundations shall be as shown on the drawings and meet ACI 318. Anchor bolts shall be in a welded cage or properly positioned by the tie wire to stirrups.

SECTION 265600 – EXTERIOR LIGHTING

- G. Install a copperclad ground rod, not less than 5/8-inch diameter by 8 feet long in pullbox adjacent to each fixture. Where rock or layered rock is present, drill a hole not less than 2 inches in diameter and 6 feet deep, backfill with tamped fine sand and drive the rod into the hole. Bond the rod to the pole with not less than number 6 AWG bare copper wires. The method of bonding shall be approved for the purpose.
- H. After leveling of pole grout base solid between plate and footing with dry pack concrete for vibration reduction.

2.04 LUMINAIRES

- A. UL 1598 and ANSI C136.17. Luminaires shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and ballast heat and safe cleaning and relamping.
- B. Light emitting diode (LED)-based solid state lighting (SSL) products shall be factory tested in accordance to the International Engineering Society (IES) LM-79 recommendations and meet ANSI C78.377-2008 standards.
- C. LED light sources shall be factory tested in accordance to IES LM-80 recommendations.
- D. LED-based SSL product shall incorporate an external heat sink, integral to the luminaire.
- E. IESNA HB-9 and RP-8 light distribution pattern types shall be as indicated on the drawings.
- F. Incorporate associated ballasts and drivers within the luminaire housing.
- G. Lenses shall be frame-mounted heat-resistant, borosilicate glass, prismatic refractors. Attach the frame to the luminaire housing by hinges or chain.
- H. Pre-wire internal components to terminal strips at the factory.
- I. Bracket mounted luminaires shall have leveling provisions and clamp type adjustable slip-fitters with locking screws.
- J. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.
- K. LED-based SSL luminaires shall be manufactured specifically for LED lamps with drivers integral to the luminaire housing.

SECTION 265600 – EXTERIOR LIGHTING

2.05 LAMPS

- A. Luminaires shall be listed for the lamp specified on the associated electrical plans. Install the proper lamps in every luminaire installed.
- B. Lamps shall be clear or coated as recommended by luminaire manufacturer to provide for maximum luminaire efficiency in fixture used.

2.06 LED-BASED SOLID STATE DRIVERS

- A. Shall be listed by either UL or equal listing agency and comply with IEEE C.62.41-1991, Class A operation.
- B. Provide a minimum power factor of 0.9.
- C. Minimum operating temperature appropriate for outdoor environments.
- D. Shall operate at a frequency greater than or equal to 120Hz.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install lighting in accordance with the CEC, as shown on the drawings, and in accordance with manufacturer's recommendations.
- B. Poles:
 - 1. Provide pole foundations with galvanized steel anchor bolts, threaded at the top end and bent 1.57 rad 90 degrees at the bottom end. Provide galvanized nuts, washers, and ornamental covers for anchor bolts. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath and the end of conduit elbow. Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location.
 - 2. After the poles have been installed, shimmed, and plumbed, grout the spaces between the pole bases and the concrete base with non-shrink concrete grout material. Provide a plastic or copper tube, of not less than 3/8-inch inside diameter, through the grout tight to the top of the concrete base for moisture weeping.
 - 3. Attach pole base cover to pole flange with set screws.
- C. Foundation Excavation: Depth shall be as indicated on drawings. Dig holes large enough to permit the proper use of tampers to the full depth of the hole. Place backfill in the hole in 6-inch maximum layers and thoroughly tamp. Place

SECTION 265600 – EXTERIOR LIGHTING

surplus earth around the pole in a conical shape and pack tightly to drain water away.

- D. Photocell Switch Aiming (where applicable): Aim switch according to manufacturer's recommendations. Mount switch on or beside each luminaire when switch is provided in cast weatherproof aluminum housing with swivel arm or set adjustable window slide for proper footcandles photocell turn-on.

3.02 GROUNDING

- A. Ground noncurrent-carrying parts of equipment including metal poles, luminaires, mounting arms, brackets, and metallic enclosures as specified in Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or alloyed connectors suitable and listed for this purpose.

END OF SECTION

SECTION 265670

LIGHTING ACCEPTANCE TESTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 - 1. The Contractor shall be responsible for the Certificate of Acceptance, but coordinate with the Certified California Lighting Controls Test Technician to assure that all required documents have been filed with and approved by the enforcement agency prior to receiving a final occupancy permit. The Certificate of Acceptance will indicate that the Contractor has demonstrated acceptance requirements of the plans and specifications, that current requirements for installation certificates are met, and that currently required operating and maintenance information (as well as the Certificate of Acceptance) were provided to the building Owner.
 - 2. Testing, evaluation and calibration of lighting controls equipment provided, installed and connected in Division 26, ELECTRICAL.
 - 3. Documentation of test results, completion of “Certificate of Acceptance” and “Certificate of Installation” forms and filing with the enforcement agency for approval.
 - 4. Specific Job Site Conditions:
 - a. Acceptance testing must be tailored for each specific design, job site, and climactic conditions. While the steps for conducting each test remain consistent, the application of the tests to a particular site may vary. The Contractor shall review the construction documents and include all required time, material, testing equipment, etc. as required to complete the requirements of this section.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 265100, INTERIOR LIGHTING.

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1.03 REFERENCES

- A. Acceptance Testing Criteria: 2016 Building Energy Efficiency Standards Non-Residential Compliance Manual.

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. All material, equipment, labor, and technical supervision to perform tests, calibrations, and documentation specified herein.
- B. Scope of Testing, Evaluation, and Calibration (as applicable):
 - 1. Automatic (master) time switches.
 - 2. Occupancy sensors.
 - 3. Automatic daylighting controls.
 - 4. Photo electric sensors.
 - 5. Daylighting controls.
 - 6. Outdoor astronomical time switches.
 - 7. Area controls.

1.05 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Test Reports:
 - 1. Written record of all tests and completion of forms included in this Section.
 - 2. At completion of project, assemble a final test report. Submit report to the enforcement agency and the Owner prior to final occupancy to include:
 - a. Summary of project.
 - b. Description of systems and equipment tested.
 - c. Visual inspection report.
 - d. Description of tests.
 - e. Test results.
 - f. Conclusions and recommendations.
 - 3. Report shall be bound in booklet form, include on the Contractor's letterhead the title of the report and the systems tested.
- C. Constructability Plan Review:
 - 1. The Contractor shall review the construction drawings and specifications to understand the scope of the acceptance tests and raise critical issues that might affect the success of the acceptance tests prior to starting construction. Any constructability issues associated with the lighting system should be forwarded to the design team for review/modifications prior to equipment procurement and installation. The Contractor shall submit on company letterhead, with the lighting control equipment

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required by Section 260500, COMMON WORK RESULTS FOR ELECTRICAL, 1.04B, a letter confirming that the constructability review has been completed and their company has reviewed and is prepared to complete the lighting acceptance testing required by this Section.

PART 2 - PRODUCTS

2.01 FORMS

- A. Lighting Installation forms and verification procedures for lighting systems that require acceptance testing can be downloaded from the following website: www.energy.ca.gov/2015publications/CEC-400-2015-033/appendices/forms/NRCI.
- B. Lighting Acceptance forms are to be provided by a Certified California Lighting Controls Acceptance Test Technician. The California Energy Commission adopted changes to the California building Efficiency Standards (Title 24, Parts 1 and 6) that require lighting controls and devices to be certified as properly installed and operational, prior to issuance of occupancy permits. All Acceptance Technicians must be employed by an Acceptance Test employer that provides support as well as quality control. Certified California Lighting Controls Acceptance Test Technicians can be found at the following website: www.calctp.org/acceptance-technicians/contractors.
- C. These completed forms will be the deliverable product to the enforcement agency and Owner as described in Section 1.04 of this Section.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Tests:
 - 1. Contractor's Responsibilities:
 - a. Perform all required tests required by this section.
 - b. Schedule testing with building Owner.
 - c. Provide Installation forms.
 - d. Acceptance forms provided by California Certified Lighting Controls Technician hired by Contractor.
 - e. Calibration of equipment such as light meters, photo electric controls, etc.
 - f. Programming of time switches (interior/exterior lighting) for operations as directed by the Owner.

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3.02 ADJUSTING

- A. Final Settings: The Contractor shall be responsible for implementing all final settings and adjustments on controls equipment as required for a complete and operating system.

END OF SECTION

DIVISION 27
TELECOMMUNICATIONS

SECTION 271300

CITY OF
LONG BEACH
TECHNOLOGY & INNOVATION

Telecommunications Division
Telecommunication, ICT, and SCS
Infrastructure Specification



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1 Introduction

1.1 Purpose

The City of Long Beach Telecommunications Division is the Authority Having Jurisdiction (AHJ) for all projects relating to Structured Cabling System (SCS) throughout all City facilities to support the Telecommunications and Information Communication Technology (ICT) infrastructure.

The Telecommunications Division specifies, requires, and provides desirable criteria for vendors and contractors to include material, workmanship, certifications, and warranties.

This document includes the City of Long Beach Telecommunications Division minimum requirements and applies, as possible, the Construction Specifications Institute (CSI) MasterFormat™ Division 27 (Communications) templates, as specified by each manufacturer. Within each section, other MasterFormat™ Divisions may be referenced as applicable. The City of Long Beach Telecommunications Division's specification will take precedence where there may be a contradiction. All questions should be clarified with Telecommunications Division.

All related industry Commissions, Standards Bodies, Institutes, Societies, Alliances, and Associations are referenced within each section of this document.

1.2 Contact Information

City of Long Beach, Technology and Innovation Department
Infrastructure Services Bureau, Telecommunications Division
411 W. Ocean Blvd., 7th Floor. Long Beach, CA. 90802
(562) 570-6774

1.3 Revision

Always consult the City of Long Beach Telecommunications Division regarding the most recent version of this specification. Rev# = yyyy.mm

Rev #	Date	Change	Name
2020.03	13 March 2020	Version 1, March 2020	TID-Telecommunications
2020.09	17 September 2020	Version 2, September 2020	TID-Telecommunications
2020.10	13 October 2020	Version 3, October 2020	TID-Telecommunications

2 City of Long Beach Telecommunications Division Minimum Requirements

2.1 MDF/IDF Room Requirements

2.1.1 Minimum requirements for MDF/IDF room include but not limited to the following:

2.1.1.1 MDF/IDF Room Size

A. Minimum MDF and IDF size for each floor is as follows:

1. If the gross square foot is 5,000 or less, the IDF shall be 10 ft. long X 10 ft. wide.
2. If the available floor space is between 5,000 and 8,000 sq. ft., the IDF shall be 12 ft. long X 10 ft. wide.
3. If the available floor space is between 8,000 and 10,000 sq. ft., the IDF shall be 15 ft. long X 10 ft. wide.
4. If the available floor space exceeds 10,000 sq. ft., but the horizontal cable placement run distance to the farthest Network Jack does not exceed the cable distance limit of 295 ft. (90 meters), then the IDF size shall be increased in size by 0.75 sq. ft. for every additional 100 sq. ft. of available floor space.
5. If a second IDF is required to manage the horizontal cable placement run distance limit of 295 ft. (90 meters), size the second IDF per the guidelines explained above.

2.1.1.2 Clearances for equipment and cross-connect

- A. Allow a minimum of 36 inches (36") of clear working space in front and 42 inches (42") at rear of equipment racks measured from the front and rear wire managers.
- B. Allow for 36-inch depth off wall for wall-mounted equipment.
- C. A minimum aisle clearance of 30-inches is required at one end of a equipment rack row.
- D. In many cases, equipment and termination hardware may extend beyond racks and backboard mounting surfaces. Clearance is measured from the outermost surface of these devices, rather than from the mounting surface of the rack or backboard.

2.1.1.3 Conduit, Sleeves, and Backboard

- A. Minimum of (2) 4' x 8' x ¾" Fire rated backboards Mounted on wall to City specified locations.
- B. 4" sleeve on top of each backboard into ceiling space (per 125 cable count)
- C. Each drop requires a ¾" EMT conduit or flex conduit accessible from the ceiling with pull rope in each conduit
 - a. Conduits are not to be shared with any other drop location
- D. At locations where systems furniture is being used, conduits or power poles should be sized to support SYSTIMAX cabling fill ratio.
 - a. The City of Long Beach Telecommunications Division will provide specs upon request.

2.1.1.4 Lighting

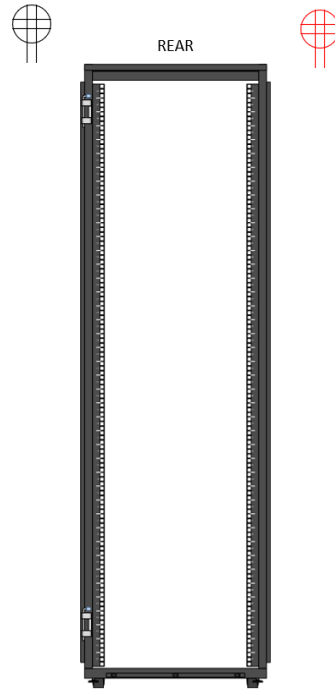
- A. Lighting shall provide a minimum light level of 50 fc at desktop level on all sides of the rack equipment.

- B. If the building is equipped with a standby power system, lighting should be connected to it, or the should be provided with its own standby lighting in case of power failure.

2.1.1.5 MDF/IDF Electrical Power Requirements

- A. Each MDF/IDF room is to have (1) grounding bus bar that is grounded to the building ground.
 - 1. Installed on City identified backboard wall; level with the Telecommunications Cabling Ladder racks.
- B. Wall - Backboard
 - 1. Provide One (1) quad box on Edison power containing two (2) duplex 20 Amp dedicated circuits, 120V AC on NEMA 5-20R-spade receptacles for each backboard.
 - 2. When possible Provide One (1) quad box on emergency generator power/building UPS power containing two (2) duplex 20 Amp dedicated circuits, 120V AC on NEMA 5-20R-spade receptacles for each backboard.
 - a. If E-Power/UPS is not available Provide One (1) quad box on Edison power containing two (2) duplex 20 Amp dedicated circuits, 120V AC on NEMA 5-20R-spade receptacles for each backboard.
- C. 4-Post, 19" Rack – Power requirements
 - 1. For each 4-post rack (Chatsworth (CPI) 15053-703), provide two (2) quad boxes with two (2) duplex 20-Amp dedicated 120V AC circuits on NEMA 5-20R-spade receptacles – one (1) quad box on each side of the rack. See diagram below (4-Post, 19" Rack – Power requirements.1).
 - a. On the rear-**LEFT** side of the 4-post rack, provide one (1) quad box on Utility power (Edison)
 - b. On the rear-**RIGHT** side of the 4-post rack, provide one (1) RED quad box on emergency generator power/building UPS power
 - 1. If E-Power/UPS is not available provide one (1) quad box on Utility power (Edison)
 - 2. Quad boxes should be suspended above the rear of each 4-post rack – not attached to the rack.
 - 3. The placement of the Quad boxes and their conduits shall not block or interfere with structured cabling or the rack's equipment mounting area (rails) on either side of rack.

Diagram "4-Post, 19" Rack – Power requirements.1":
4-post Rack with two (2) quad boxes, one per side



D. Uninterruptible Power Supply devices:

1. A UPS will be installed at the bottom of each rack
2. The UPS should connect to the building's **protected power source (Generator)** when available
3. All rack electronics will terminate: **Power Supply-B** to the UPS
 - a. If a device has only (1) power supply, it will terminate to the UPS
4. Use APC UPS of this minimum equivalent type
 - a. Schneider Electric (APC) SMART-UPS **1500VA** LCD RM 2U 120V WITH NET
 - b. Schneider Electric (APC) SMART-UPS **2200VA** LCD RM 2U 120V W/CARD
5. All UPSs will be configured and network-cabled for Monitoring and Network Management – please consult with the City of Long Beach Telecommunications Division for IP information

E. Power Distribution Units:

1. A single horizontal, rack-mounted PDU, will be placed on the rear of the 4-post rack, approximately midway up the rack
2. The PDU will receive building (Utility) power input
3. All rack electronics will terminate: **Power Supply-A** to the PDU
 - a. If a device has only (1) power supply, it will terminate to the UPS
4. PDU model to be used (or similar spec – can be discussed with City of Long Beach Telecommunications Team):
 - a. Schneider Electric (APC) APC AP7800B
 1. Metered, 1U, 15A, 100/120V, (8) 5-15

2.1.1.6 ENVIRONMENTAL REQUIREMENTS

A. HVAC

1. Each MDF/IDF in a building should have its own dedicated HVAC not connected to or controlled by other building HVAC systems. HVAC must be designed for 24 hours per day, 365 days per year operation and shall have its own thermostat. If the building is supported by a standby power system, consider connecting it to the HVAC system(s) that serve each room.
2. HVAC systems shall not use the same electrical panel that is used to support the outlets servicing the electronics housed within MDF/IDF.
3. The temperature in a MDF/IDF shall be maintained in the range of 68°F to 77°F.
4. The humidity range should be maintained at 30% to 55% relative humidity.
5. MDF/IDF shall ventilate at the rate of one air change per hour.

2.1.1.7 TELECOMMUNICATION PATHWAY

A. Riser pathway

1. Riser pathway interconnects the MDF/IDF in a building.
2. (1) 4" sleeve will be installed from the MPOE to the first IDF. Then each IDF will connect to the one above it with (1) 4" sleeve.

B. Primary horizontal cabling pathways

1. At a minimum requirement a 2" sleeve is needed for primary horizontal pathways. It will always require pathway fire-wall penetration fire-stop technology through the IDF walls into the occupied space of the floor. Other wall penetrations may be required depending on the wall/ceiling layout of the service area.

2.2 Minimum Network Drop Requirements

A. Minimum requirements for a network drop include but not limited to the following:

1. The standard (1) drop location contains (2) CAT6 cables in a Single-gang P-Ring (not a Box)
2. Each drop requires a ¾" EMT conduit or flex conduit accessible from the ceiling with pull rope in each conduit
 - a. Conduits are not to be shared with any other drop location
3. At locations where systems furniture is being used, conduits or power poles should be sized to support SYSTIMAX cabling fill ratio.
 - a. The City of Long Beach Telecommunications Division will provide specs upon request.
4. Cable path hanger rods from all network drops to the MDF/IDF room shall be spaced to prevent cables from sagging or buckling.
5. Provide 4" sleeves through all fire rated walls, along the cable path, and ensure fire caulking is applied.

2.3 Wireless Access Point Specifications

2.3.1 Device Specification

The City of Long Beach Telecommunications Division will provide the required Access Point device for each application. As of the date this document was written, the following devices are the standard; they fulfill the City of Long Beach's minimum requirements.

- A. Indoor:
 - 1. Cisco Aironet AIR-AP3802I-B-K9
- B. Outdoor:
 - 1. Cisco Aironet AIR-AP1562I-B-K9 (Fiber) for >100m applications; 60w
 - 2. Cisco Aironet AIR-AP1542I-B-K9 (Copper) for <100m applications

2.3.2 Deployment

- A. The Contractor will install the provided Access Point devices
 - 1. Contractor to ensure that all required hardware is provided and will install at specified location
- B. Coordinate power and cabling needs with the City of Long Beach Telecommunications team
 - 1. The Network switch must be able to provide PoE+ power for copper applications
- C. Height and placement location to be provided by the City of Long Beach Telecommunications team
- D. The City of Long Beach will provide a Heat-Map and specific location of the Access Point to be installed
- E. Provide signal attenuation concerns to the City of Long Beach Telecommunications Team, that may be caused by buildings, trees, foliage, and weather conditions
- F. Ensure that integrated weather and environmentally protected Access Point housing are correctly sealed
- G. Ensure proper and secure mounting of the AP device and all hardware
- H. Ensure that correct copper cabling is used for either indoor (ISP) or outdoor (OSP) installations
 - 1. Dual CAT6A CommScope SYSTIMAX cabling drops are to be provided – refer to the CommScope Appendix for part number
 - 2. The cable shall be 20' looped and then terminated on SYSTIMAX orange inserts (category 6a) and installed with white SMB
 - 3. The locations shall be marked with a small sticker on the T-bar
- I. For locations where cable distance exceeds 100m, Corning fiber optics composite cabling will be required
 - 1. As needed, The City of Long Beach will provide a 1RU PoE power supply shelf with (6) PSM-I modules is to be installed in the network cabinet
 - Model:** Corning PSU6-6PS
 - Refer to the Corning MasterFormat Section 3.2.15 "26 27 00 Low-Voltage Distribution Equipment" for Low-Voltage device standards
 - 2. As needed, GPON ONTs will be provided by The City of Long Beach
 - 3. Refer to the Corning Appendix for cabling part number – distance will determine gauge/cable Part Numbers

2.4 Fiber Optic Specification and Standards

2.4.1 General

- A. The specifications provided within this document consists of furnishing and installing all equipment and materials needed to perform and complete the necessary project.

2.4.2 Fiber Optic Cable

- A. The fiber optic cable components shall be designed for the intended purpose intended and manufactured by a company regularly engaged in the production of material for the fiber optic industry.
- B. All components or assemblies of the same type shall be from the same manufacture.
- C. All fiber optic cables shall be listed by UL for the purpose they are providing and shall conform to the NEC standards.

2.4.3 Inside Plant fiber cable, CORNING (Armored)

- A. **MIC® 250 Interlocking Armored** Distribution Cable, Plenum 12 F, Single-mode (OS2).
 - 1. Corning MIC® 250 cables utilize 250 µm color-coded optical fibers surrounded by dielectric strength members with a flexible, flame-retardant outer jacket.
 - 2. The core is protected by a flexible, spirally-wrapped, aluminum interlocking armor that offers easy, one-step installation.

2.4.4 Inside Plant fiber cable, CORNING (Armored)

- A. **ALTOS® Lite Loose Tube, Gel-Free, SingleJacket, Single-Armored Cable** 12 F, Single-mode (OS2).
 - 1. The single armored construction provides additional crush and rodent protection with a high-strength ripcord under the armor for easy stripping.
 - 2. The loose tube design provides stable and highly reliable transmission parameters for a variety of voice, data, video and imaging applications.

2.4.5 Outside Plant Fiber Cable

- A. **Corning ALTOS® cable with Binderless FastAccess™** technology is an all -dielectric gel -free cable designed for outdoor duct installations (**Part Number: 096ZP4-T3F20D20**).
 - 1. The innovative FastAccess™ technology feature combined with the gel -free binderless loose tube design simplifies removal of the cable jacket and accessing the buffer tubes.
 - 2. The cable is fully water blocked using craft -friendly, water swellable materials, which means no cleanup is required.
 - 3. The flexible buffer tubes are easy to route in closures, and the SZ -stranded, loose tube design isolates fibers from installation and environmental rigors while allowing easy midspan access.
 - 4. The all -dielectric gel -free cable construction requires no bonding or grounding, and these cables have a high-density polyethylene jacket that is rugged, durable and easy to handle.
 - 5. This fiber cable is based on, per project and per application.

2.4.6 Wall-Mountable Connector Housing (WCH)

- A. Corning wall -mountable connector housing (WCH Part Number: WCH-02P) product family offers enhanced innovative features that make installation and troubleshooting of fiber optic connectivity faster, easier and more cost -effective.
1. From fiber and cable routing and strain-relief to port labeling and termination, these housings reduce the risk of error that can disrupt networks.
 2. The WCH housings provide interconnect or cross connect capabilities between the outside plant, riser or distribution cables.

2.4.7 Closet Connector Housing

- A. **(CCH Part Number: CCH-01U)** Closet connector housings (CCHs) provide interconnect or cross -connect capabilities between outside plant, riser or distribution cables and opto-electronics. Like other LANscape solutions hardware, the housings accept CCH connector panels. In addition, the housings accept CCH cassettes and CCH modules. From fiber and cable routing and strain relief, to port labeling and termination, these housings reduce the risk of error that can disrupt networks.
1. The units are designed for rack mounting in 19 -in (48 cm) racks or optional 23 -in (58 cm) equipment racks (1.75 -in EIA hole spacing).
 2. They are available in rack space options of 1U (two panels, cassettes or modules), 2U (four panels, cassettes or modules), 3U (six panels, cassettes or modules) and 4U (12 panels, cassettes or modules).
 3. The 1U, 2U and 3U options feature a slide -out tray and see -through, removable top covers.
 4. The CCH -04U features a clear door, removable front and rear enclosures and a platinum -colored interior for maximum visibility and access.
 5. Every CCH housing is shipped complete with strain relief brackets, routing clips and guides, and mounting brackets for proper installation.
 6. Documentation labels are provided, and components can be added as needed to construct a fiber distribution frame for any application.
 7. All housings include a removable tinted polycarbonate front door.
 8. All size housings have field -installable lock kits available for both front and rear doors.
 9. All CCH housings can also be upgraded for pigtail splicing to full fiber capacity and easy, modular fiber management through the use of CCH Splice Cassettes (CCH -CS), or for easy, modular fiber management when using field -installable connectors through the use of CCH Slack Cassettes (CCH -CF).

2.4.8 CCH Splice Module with Pigtails 12F, LC Duplex, aqua

- A. **(Part Number: CCH-CS12-E4-P00QE)** CCH splice modules with pigtails enable faster field splicing and easy modular management of connectorization within the housing.
1. The CCH splice modules with pigtails are preloaded and pre -routed for quick fusion splicing of either individual or ribbon fiber pigtails, using the same space -saving platform as the standard CCH splice module.
 2. The pre-routed splice modules with pigtails reduce field labor by streamlining the features and components of the pigtail module to allow for efficiencies in the field. They are prepped with a 2-meter pigtail assembly with all pre -existing CCH panel connector options.

3. The splice modules have 900 μm at the connector panel for added durability and colored 250 μm for ease of splicing as well as having strain relief pre -applied to the assemblies from the manufacturing facility.
4. With the splice module, the field will also enjoy the elimination of individual splice trays or separate splice housings, as well as allowing splicing to be done away from the rack housing in a suitable workspace as needed. The modular design makes it easy to access the fiber in an individual module without disturbing the other fibers in the housing.

2.4.9 UniCam® Connector, LC single-mode (OS2) Corning UniCam® high -performance connectors

- A. **(Part Number: 95-200-99)** offer best -in -class optical performance in a fast, easy field termination solution. These high -precision zirconia ceramic ferrule connectors assured exceptional insertion loss – 0.1 dB typical/0.5 dB maximum per connector pair for multimode, 0.2 dB typical/0.5 dB maximum per connector pair for single -mode.
1. Installation of an LC, SC or ST® compatible connector can be accomplished in about 50 seconds to one minute with the UniCam high performance tool kit.
 2. The lightweight, handheld installation tool and high- performance precision cleaver virtually eliminates human variability during installation, ensuring terminations are right the first time, every time.
 3. This kit was designed with consideration for network installers, from the cleaver, with its intuitive, hand -held precision design and dual -clamp precision hold, to the installation tool, with its immediate go/no -go feedback signal indicating proper mating of the field fiber to the fiber stub.
 4. Installation is as easy as strip, clean, cleave, cam and crimp, with exceptional optical performance assured.
 5. Every UniCam® connector is assured to meet the published specification at the time of installation or Corning will replace it.

2.4.10 Single Mode Fiber Optic (SMFO) cables should meet the following requirements:

- A. Fiber strand per cable:
12,24,36,72,96,144 and up to 432 fibers depending on application per project
- B. Maximum attenuation:
< 0.35 dB/km at 1310nm
< 0.30 dB/km at 1550 nm
- C. Cladding diameter: 125.0 microns + 1.0 microns
- D. Core Diameter: 8.3 microns nominal
- E. Core Eccentricity: < 1.0 micron (0.3 micron typical)
- F. Temperature range: -34°C to + 74°C
- G. Coating Diameter: 245 \pm 10 microns
- H. Cable Construction: Loose tube
- I. Outer Jacket: Polyethylene
- J. Tensile Strength: 600 pounds
- K. Central strength member: Dielectric
- L. Mode field diameter: 9.3 \pm 0.5 microns at 1310 nm
- M. Zero dispersion wavelength: 1300 to 1320 nm

- N. Zero dispersion slope: ≤ 0.092 picosecond/nm²-km
- O. Cutoff wavelength: 1260 nm
- P. Point discontinuities at 1300nm: ≤ 0.1 dB
- Q. The SMFO cables shall be constructed using reverse oscillation or S-Z stranding to allow a length of buffer tube to be separated from the cable without cutting of the complete tube. Optical fibers shall be distinguishable from others in the same buffer tube by means of color coding according to the following:

1. Blue (BL)	5. Slate (SL)	9. Yellow (YL)
2. Orange (OR)	6. White (WT)	10. Violet (VL)
3. Green (GR)	7. Red (RD)	11. Rose (RS)
4. Brown (BR)	8. Black (BK)	12. Aqua (AQ)

- R. The colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598A "Color Coding of Fiber Optic Cables." The color formulation shall be compatible with the fiber coating and the buffer tube filling compound and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together. Cables shall be gel free and consistent with a dry water blocking material.
- S. The cable shall contain at least one ripcord under the jacket for easy sheath removal. The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable" or "Fiber Optic Cable", the number of fibers, "SM" or "Single Mode", year of manufacture, and sequential measurement markings at a minimum of every three feet. The actual length of the cable shall be within 1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket (yellow or white are preferred). The height of the marking shall be approximately one-tenth of an inch.
- T. All SMFO cables shall be in accordance with ANSI/ICEA S-87-640 mechanical and environmental specifications and have minimum pull strength of 600 lbf (2700 N) for fiber counts over 12 fibers. All fiber optic cables shall be terminated on SC connectors. Fiber optic cable shall meet the following test requirements:
 - 1. Pre-Installation Testing:
A fiber optic reel test shall be provided by the contractor that verifies that the fiber meets loss budgets that are called out in these specifications. The Contractor shall inspect all cable upon delivery and again prior to installation. Any cable that is found to have visual damage shall be tested using an OTDR per the following section prior to installation.
 - 2. Post-Installation Testing:
After installation and splicing of cable, but prior to the final splices to the existing 12 SMFO, the contractor shall perform the following tests:

2.4.11 Testing

- A. **Power Meter Tests:** Install feed through connectors at all locations where an Ethernet switch is to be connected. Conduct power meter tests for each fiber to demonstrate connectivity and attenuation from origin to destination. Demonstrate that the attenuation for each fiber path including connectors, and splices as, a whole, comply with the loss budgets required by these special provisions.

- B. **OTDR Tests:** Conduct bi-directional tests using an OTDR for each fiber. Demonstrate that the attenuation for each fiber and splice, individually, comply with the loss budgets required by these special provisions. Test fibers at 1310 nm and 1550 nm using a launch cable no less than three times the pulse width used to shoot the cable. **Submit OTDR traces for approval.** Clearly annotate each splice and identify the measured loss.
- C. The minimum requirements for the Contractor or designated Subcontractor involved in the installation and testing of the fiber optic cable are: Three (3) years' experience in the installation, testing and maintenance of fiber optic cable. Two (2) installations where fiber optic cable was installed, and the network has remained in continuously satisfactory operation for at least two (2) years.
- D. The Contractor shall submit as proof, photographs or other support documents, and the names and contact information of the operating personnel who can be contacted regarding the network's operation. The Contractor shall identify any unacceptable losses and make corrective actions at no additional cost. Failed splices may be remade and re-tested for compliance. The Contractor shall replace any cable in its entirety that is not compliant with these special provisions at no additional cost.
- E. The contract price paid per linear foot for bid "Fiber Optic Cable" includes full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing SMFO Cable, complete in place, including racks and hooks in pull boxes or splice vaults, termination strips, terminations, labeling, testing, warranty, documentation and spare parts, as shown in the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.
- F. Payment to furnish and install fiber optic cable shall be included in the lump sum prices bid and no separate payment shall be made therefor.

2.4.12 Traffic Signal and Communication Pull Boxes.

- A. The Contractor shall furnish and install pull boxes as shown on the Plans. Pull boxes shall be No. 6 unless otherwise noted on the Plans and be constructed in accordance with **State Standard Specifications Subsection 86-2.06C, "Installation and Use"** and **State Standard Plan No. ES-8**. All No. 6 pull boxes shall be 30 inches in depth and shall have grouted bottoms. Pull boxes shall not be located in or within 1 foot of a curb ramp. Pull box covers shall be labeled with "TRAFFIC SIGNAL" and for each interconnect pull box shall read "COMMUNICATION". All pull box replacements will require the contractor to vertically adjust connecting conduit a distance of 15' in each direction from the pull box.
- B. All pull boxes and pull box covers shall be Quazite (or approved equal) polymer concrete reinforced with fiberglass. All units shall utilize stainless steel Penta head bolts. All pull boxes called out in the design that are identified as #5 shall be Tier 15 and #6's shall be Tier 22.
- C. Pull boxes and their covers are required to conform to all test provisions of the most current ANSI/SCTE 77 "*Specification for Underground Enclosure Integrity*" for Tier 15 and 22 applications. When multiple "Tiers" are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box & cover) are manufactured using matched surface tooling. Independent third-party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal.
- D. All pull box and fiber splice vault locations shall be considered approximate. The Contractor shall **furnish approximately 50' of service loop inside of pull box No.6 (2'x3')** in order to comply within

- these requirements and the proposed location of the pull box and or fiber splice vault after verification of underground utilities and obtain approval of the location by the Engineer prior to construction.
- E. All pull boxes and fiber splice vaults, the locations of which are not shown on the plans, shall be placed within City ROW. All work associated with concrete removal and replacement shall be considered included in the price for pull boxes. No additional compensation will be allowed therefor. The compaction around the box shall not cause the sides to deflect or any part of the box or lid to crack or become dented.
 - F. **The Contractor shall replace all cracked, broken, chipped or damaged pull boxes or lids at no additional cost to the City.**
 - G. At locations where the Contractor is required to remove an existing pull box and replace it with a new splice vault, the Contractor shall remove the existing pull box, stone sump, and ground rods and dispose of properly. The new splice vault shall be placed where the old pull box was removed unless otherwise directed by the Engineer. The Contractor shall adhere to the conduit deflection parameters as noted in the Plans and these special provisions when modifying or adding conduit sweep adjustments.
 - H. At locations where the Contractor is required to make conduit sweep adjustments, the Contractor shall be required to hand dig or chip away the existing concrete encasement around the conduits to achieve the required conduit sweeps into the pull box. The Contractor shall remove the concrete encasement in such a manner that it will not damage the conduit system and its contents. The Contractor shall replace cracked, broken, chipped, or damaged conduit and conduit contents at no additional cost to the City.
 - I. Pull boxes, pull box covers and pull box extensions shall be concrete or concrete reinforced with fiberglass. Splice vaults shall conform to the requirements as shown on the Plans. Double stacked pull boxes as specified in the plans will be measures as a single unit for payment purposes.
 - J. Within the pull box, the Contractor shall place the conduit so that the bottom part of the opening is at least 2 inches above the bottom of the pull box and so that the top part of the openings is at least 8 inches from the top of the pull box. The conduit shall be placed to allow the cable to be pulled in a straight line and clear the top of the pull box by 2 inches (angle of exit). Conduits shall terminate within 2 inches of their entry into the pull box.
 - K. Payment for traffic signal and communication pull boxes shall be included in the lump sum prices bid and no separate payment shall be made therefor.

2.4.13 Fiber Optic Splice Closure (COMMSCOPE FOSC)

- A. **FOSC 450** fiber optic splice closures are designed for use most anywhere within the city of Long Beach. project is required along with fiber splicing and storage needs. Per manufacturer recommendations and typical FOSC installation process, the contractor shall flash test the closure to 5 psi. Thoroughly soap seals to check for integrity and leaks.
- B. These closures are available in five sizes, each featuring:
 1. Re-usable compressed gel cable sealing components that accommodate a wide range of cable sizes
 2. Capability to accommodate a variety of cable styles including loose tube or central core tube cables with single or ribbon fibers
 3. Hinging splicing trays that provide controlled access to splices and slack storage
 4. Splice and storage compartments accessible via a removable dome-clamp system

5. Thermoplastic outer materials that withstand temperature and contaminate extremes Slack storage baskets of various sizes that provide different slack storage scenarios

END OF SECTION

3 Manufacturer MasterFormat™ Specifications

3.1 COMMSCOPE



CommScope

MasterFormat

Division 27 Requirements

The intent of this document is to provide customers with assistance in completing the Construction Specifications Institute (CSI) MasterFormat™ template for a CommScope telecommunication cabling system. This document provides the minimum performance criteria for the components and sub-systems comprising a complete cabling system. When the complete telecommunication cabling system is installed by an authorized contractor in accordance with the manufacturer's instructions, the cabling system shall be warranted per the CommScope system performance and component warranties.

Product part numbers, general design considerations, and installation guidelines are provided in this document. This document provides pertinent information to allow the contractor to bid the labor, supervision, tooling, and miscellaneous mounting hardware and consumables to install a complete system. It is the responsibility of the contractor to propose any and all items required for a complete system if not identified in this specification. This document is for planning purposes only and is not intended to modify or supplement any specifications or warranties relating to CommScope products or services.

Revision v1.2v
7-6-2018

COMMSCOPE MASTERFORMAT

3.1.1 27 02 00 General Requirements (Structured Cabling Systems and Pathways and Spaces systems for all Voice and Data systems)

3.1.1.1 27 02 01 Summary

- A. The Scope of Work covered by this document is to furnish and install the Structured Cabling Systems and Pathways and Spaces systems for (City of Long Beach). This work will provide for the structured cabling system (SCS) for all Voice and Data systems. Work on this project will commence after the award of the bid to a successful bidder.
- B. Contact Information:
 - Owner's Representative:
 - Name:** Telecommunications Division, Infrastructure Services Bureau
 - Company:** City of Long Beach, Technology and Innovation Department
 - Address:** 411 W. Ocean Blvd., 7th Floor. Long Beach, CA. 90802
 - Phone:** (562) 570-6774
- C. Telecommunications system shall include the following systems:
 - 1. Structured Cabling System (SCS) For Telecommunications Systems
 - 2. Pathways for Telecommunications Systems
 - 3. Grounding and Bonding System (GBS) For Telecommunications Systems
 - 4. Firestopping for Telecommunications Systems

3.1.1.2 27 02 05 Additional Requirements

- A. **Integration:** Responsibility for overall telecommunications system integration and coordination of work among trades, subcontractors, and suppliers shall rest with Contractor named in construction contract issued by Owner's Representative. Work covered by this division of specifications shall be coordinated with related work indicated on drawings or specified elsewhere under project specifications. Work related to telecommunications system shall be performed under direct supervision of telecommunications system installer in a manner approved by product manufacturer.
- B. **APPROVED CONTRACTOR:** The Telecommunications Contractor must be a Certified CommScope SYSTIMAX Installer for the products and/or system being supplied and must be able to demonstrate active CommScope Partner Certification including current completion of CommScope's Design & Engineering Course (SP3321) and Installation & Maintenance Course (SP3361). A current and valid copy of certification of authorization documents must be submitted with the quote in order for such quote to be valid. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with said certification. At least (1) for every (3) members of the copper installation and termination crew must be certified to a Technician Level of training by the product manufacturer or BICSI. At least (1) for every (5) members of the optical fiber installation and termination crew must be certified by Corning or other approved organizations in Optical Fiber installation and termination practices.

- C. **Coordination of Work:** Contractor shall be responsible for coordination of work among project specification divisions and contractor/subcontractors involved in this project. This Coordination of Work includes following instructions provided the Construction Manager or General Contractor if project is managed by such. See section 27 02 10 for additional information.
- D. **General Compliance Requirements:** Provide a complete and operable system in compliance with project drawings, specifications, referenced standards, applicable building codes, and Authority Having Jurisdiction (AHJ) requirements. Scope of this contract includes planning, design, materials, equipment, labor, configuration, programming, testing, startup and commissioning services, and documentation costs for complete and operable system that meets all requirements indicated on drawings or contained in specifications. Comply with all contract documents, specifications, drawings, manufacturer's instructions, and Owner and AHJ requirements. In case of conflict among applicable documents or standards, contractor shall notify owner's representative in writing of apparent conflict, and then comply with most stringent requirements unless otherwise directed in writing from owner's representative. Work Includes all items required for complete system whether or not identified in specification or drawings.
- E. Information about general construction and architectural features and finishes shall be derived from structural and architectural drawings and specifications only.
- F. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
- G. Work related to telecommunications system shall be installed by an SCS manufacturers authorized or certified trained installer and supervised an SCS manufacturers authorized or certified SCS Engineer. Owner reserves the right to review and approves any personnel assigned to this project in a supervisory or managerial role.
- H. SCS contractor shall have had at least 10 years of comparable experience with telecommunications projects. As part of the proposal, SCS installer shall submit at least three (3) comparable Project reference descriptions with reference contacts. Comparable projects shall equal or exceed size and complexity of work on drawings.
- I. **Complete and Usable Work:** Refer to and comply with requirements in section 27 02 67 outlined below.
- Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any telecommunications item in the drawings and specifications for telecommunications work carries instruction to furnish, install, and connect the item as part of the telecommunications work regardless of whether this instruction is explicitly stated.
 - Provide materials and equipment, along with accessories and additional work required for field conditions, and additional work and accessories required for complete, usable, and fully functional construction and systems. City may opt to provide material and equipment.
 - Provide a complete and operable system in full compliance with requirements on drawings and specification requirements, including required accessories, devices, equipment, wiring, programming, configuration, and work to provide complete and operable system complying with drawing, specification, and performance requirements.

3.1.1.3 27 02 10 *Related Digital Format Documents and Drawings*

- A. **General:** The project drawings and general conditions of Contract shall apply to this section. All Documents and Drawings must be in Digital format- CAD, PDF, Excel, Visio, or another Digital Format approved by the City of Long Beach's Infrastructure Services Team.
- B. **Coordination:** Coordinate with work specified in other sections and divisions of specifications.
- C. **Reference:** Codes and standards as referenced in Section 27 02 20 may define additional specifications or requirements not specifically called out within this division. However, contractor shall adhere to most stringent requirements as defined herein, or as defined by reference within section 27 02 20.
- D. Architectural and Engineering specifications may have additional conditions or requirements that affect the work defined by this division of specifications. Contractor shall be responsible for the coordination of all conditions and other trade requirements that may impact schedule, scope of work, work progress, or other factors that may affect the overall ability for contractor to execute the requirements of this division of specifications.

3.1.1.4 27 02 20 *Codes and Standards*

- A. General: All work, including but not limited to: cabling, pathways, support structures, wiring, equipment, installation and workmanship shall comply with the latest editions of the requirements of the Authority Having Jurisdiction (AHJ), National Electrical Code, National Electrical Safety Code, all applicable local rules and regulations, equipment manufacturer's instructions, and the National Electrical Contractors Association (NECA) Standard of Installation. In case of discrepancy or disagreement between the documents noted above, the Contractor shall satisfy the most stringent requirements.
- B. Other sections of this document contain References to Codes and Standards that are applicable to the section.

3.1.1.5 27 02 20.20 *Codes*

- A. Insulated Cable Engineers Association (ICEA)
 - ANSI/ICEA S-80-576-2002, Category 1 & 2 Individually Unshielded Twisted-Pair Indoor Cables for Use in Communications Wiring Systems
 - ANSI/ICEA S-84-608-2002, Telecommunications Cable, Filled Polyolefin Insulated Copper Conductor
 - ANSI/ICEA S-90-661-2002, Category 3, 5, & 5e Individually Unshielded Twisted-Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems
 - ICEA S-102-700-2004, ICEA Standard for Category 6 Individually Unshielded Twisted- Pair Indoor Cables for Use in LAN Communication Wiring Systems Technical Requirements, 2004
- B. National Fire Protection Association (NFPA) NFPA 70, National Electrical Code® (NEC®)
 - NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, NFPA 72, National Fire Alarm Code®
 - NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment NFPA 76, Recommended Practice for the Fire Protection of Telecommunications Facilities NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
 - NFPA 101, Life Safety Code®

NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials

NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces

NFPA 780, Standard for the Installation of Lightning Protection Systems NFPA 5000™, Building Construction and Safety Code

3.1.1.6 27 02 20.40 Reference Standards

- A. Telecommunications Industry Association (TIA)
- B. ANSI/NECA/BICSI 568-2006, Standard for Installing Telecommunications Systems ANSI X3T9.5, Requirements for UTP at 100 Mbps
 - ANSI/TIA-526.7-A, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - ANSI/TIA-568.0-D, Generic Telecommunications Cabling for Customer Premises ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard
 - ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard
 - ANSI/TIA-568.3-D, Optical Fiber Cabling and Components Standard
 - ANSI/TIA-568-C.4, Broadband Coaxial Cabling and Components Standard
 - ANSI/TIA-569-D, Telecommunications Pathways and Spaces
 - ANSI/TIA-606-C, Administration Standard for Telecommunications Infrastructures
 - ANSI/TIA-862-B, Structured Cabling Infrastructure Standard for Intelligent Building Systems
 - ANSI/TIA-942-B, Telecommunications Infrastructure Standard for Data Centers
 - J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - T-526-14-C, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - TIA-598-D, Optical Fiber Cable Color Coding
 - TIA-604.3-B, FOCIS 3—Fiber Optic Connector Intermateability Standard, Type SC
 - TIA-604.10-B, FOCIS 10—Fiber Optic Connector Intermateability Standard, Type LC
 - TIA TSB-125, Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning
 - TIA-758-B, Customer-owned Outside Plant Telecommunications Infrastructure Standard
 - TSB-155-A, Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
- C. Other Reference Materials
 - ANSI/NECA/BICSI-568-2006, Standard, Installing Commercial Building Telecommunications Cabling
 - BICSI Outside Plant Design Reference Manual (COOSP), current edition.
 - BICSI Electronic Safety and Security Reference Manual (ESSDRM), current edition
 - BICSI Information Transport Systems Installation Methods Manual (ITSIM), current edition
 - BICSI Network Design Reference Manual (NDRM), current edition
 - BICSI Telecommunications Distribution Methods Manual (TDMM), current edition
 - BICSI Wireless Design Reference Manual (WDRM), current edition

Institute of Electrical and Electronic Engineers (IEEE) National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL) Cable Certification and Follow Up Program

3.1.1.7 27 02 25 *Abbreviations, Acronyms and Definitions*

3.1.1.7.1 27 02 25.20 **Abbreviations and Acronyms**

ACD	Automatic Call Distribution
AFF	Above Finished Floor
AWG	American Wire Gauge
BICSI	Building Industry Consulting Services International
CAT5	Category 5 Copper Cable
CAT5e	Category 5e Copper Cable
CAT6	Category 6 Copper Cable
CAT6A	Category 6A Copper Cable
CDDI	Copper Distributed Data Interface
CMP	Communications Multipurpose Plenum: cable rating
CMR	Communications Multipurpose Riser: cable rating
EIA	Electronic Industries Association
ELFEXT	Equal-Level Far-End Crosstalk
FEXT	Far End Crosstalk
Gbps	Gigabits per second
HSM	High Speed Migration
HVAC	Heating, Ventilation, and Air Conditioning
IDF	Intermediate Distribution Frame - Termination frames, relay racks, and cable management
IEEE	Institute of Electrical and Electronics Engineers
IM	Information Management
ISDN	Integrated Services Digital Network
LAN	Local Area Network
Mbps	Megabits per second
MDF	Main Distribution Frame, consisting of carrier entrance rooms and head-end
MMF	Multi-mode fiber optics, 50 or 62.5-micron laser optimized core
MUTOA	Multi-User Telecommunications Outlet Assembly
NEXT	Near End Cross Talk
NRTL	Nationally Recognized Testing Laboratories
OSHA	Occupational Safety and Health Act
PBX-	Private Branch Exchange: telephone switch
PDS	Premises Distribution Systems (See SCS)
PoE	Power over Ethernet (IEEE 802.3af)
POP	Point of Presence
PSACR	Power Sum Attenuation-to-Crosstalk Ratio
PSAFEXT	Power Sum Alien Far-End Crosstalk
PSAELFEXT	Power Sum Alien Equal Level Far-End Crosstalk

PSANEXT	Power Sum Alien Near-End Crosstalk
PSELFEXT	Power Sum Equal Level Far-End Crosstalk
PSNEXT	Power Sum Near-End Crosstalk
SCC	Security Command Center
SCS	Structured Cabling System, or Structure Connectivity System; a complete cabling system
SFF	Small Form Factor
SMF	Single-mode fiber optics, 8.3-micron core
TC	Telecommunications Closet
TE	Telecommunications Enclosure
TEF	Telecommunications Entrance Facility
TIA	Telecommunications Industry Association
TR	Telecommunications Room
TO	Telecommunications Outlet
UPS	Uninterruptible Power Supply
UTP	Unshielded Twisted Pair
VoIP	Voice over Internet Protocol
WAO	Work Area Outlet
WAN	Wide Area Network

3.1.1.7.2 27 02 25.40 Definitions

Access Floor - A floor system that has removable floor panels.

Building Backbone Cabling - Cabling used to connect Floor Distributors (FD) or other local collection points to the Building Distributor (BD). Building backbone cabling typically carries aggregate traffic and, as such, impacts multiple network devices and users.

Building backbone cabling may include either fiber optic or copper cabling or both.

Building Distributor (BD) - Termination point from which all building backbone cabling emanates, and interconnection point for the network backbone. Commonly referred to as BDF in Americas, Main Comm Rooms in EMEA and Communication Room, IT Lab or IT Room in AsiaPac. Referred to as BD in international and European industry standards and Intermediate Cross-connect (IC) in American industry standards. There is one BD for each building and it feeds all FD's in the same building. The BD should be located so that all FD's served are within 300 cable meters (984 cable feet). All BD's are linked to the

Campus Backbone Cabling - Cabling used to connect Building Distributors (BD) or other key network segments to the Campus Distributor (CD). With rare exceptions, campus backbone cabling carries aggregate traffic and typically impacts entire buildings worth of network devices and users and, as such, link redundancy with diverse routing is highly recommended. Campus backbone cabling almost exclusively consists of fiber optic cabling. Copper cabling may be used in short-distance (< 90m) applications. In such cases, lightning protection will usually be required by code.

Campus Distributor (CD) – Termination point from which all campus backbone cabling emanates, and highest-level interconnection point for the network backbone. Commonly referred to as NOC in Americas and Main Comm Rooms in EMEA. Referred to as CD in international and European industry standards and Main Cross-connect (MC) in American industry standards. On smaller campuses, there is one CD for the campus. On larger campuses, there might be several CD's with each CD serving several buildings. Besides linking to each of the BD's it serves, the CD is also the network interconnection point for data center links and links to service providers.

Category 6 (Cat 6) / Class E – A category/class of transmission performance that specifies electrical properties up to 250 MHz Refer to the TIA- 568-C family of standards for more information on Category 6 and ISO/IEC 11801 for more information on Class E requirements. Also, refer to CENELEC EN50173.

Category 6A (Cat 6) / Class EA – A category/class of transmission performance that specifies electrical properties up to 500 MHz and capable of supporting data applications operating at 10Gbps. Refer to the TIA-568-C family of standards for more information on Category 6 and ISO/IEC 11801 for more information on Class EA requirements.

Certification – The testing and documentation of the transmission performance (e.g., Category 5e / Class D) of a permanent link or channel, based on sweep frequency (where applicable) testing of numerous parameters with results compared to a range of acceptable values. This project requires 100% certification (with documentation) of all permanent link cabling at the time of installation. Channel certification is optional and is the responsibility of the group using the channel.

Channel – The entire physical pathway between active equipment ports, inclusive of all patch cords, patch panels, jacks and cabling segments.

Class C – A category of transmission performance, defined in ISO and EN standards, that specifies electrical properties up to 16 MHz

Conduit - A raceway of circular cross-section.

Entrance Facility (EF) – Termination point of service provider cables that have entered the building and location of service demarcation point (MPOE) and interconnection point to the network. Commonly referred to as Telco Room in Americas, POP Room in EMEA and Building Entrance in AsiaPac. Referred to as Building Entrance Facility in international and European industry standards and Entrance Facility (EF) in American industry standards. The EF is linked to the CD, where present, or to the BD.

Floor Distributor (FD) – Termination point for horizontal cabling and interconnection point for network access. Commonly referred to as IDF in Americas and AsiaPac and as Sub Comms Room in EMEA. Referred to as Floor Distributor (FD) in international and European industry standards and Horizontal Cross-connect (HC) - FD quantities and locations are determined by building size and geometry so that all points served are within 90 cable meters (295 cable feet) of an FD. The FD feeds all Telecommunications Outlets (TO's) in its service zone. All FD's in a building are linked to the building's Building Distributor (BD) via backbone cabling.

Horizontal Cabling – Cabling used to connect individual work area outlets to local Floor Distributors (FD) or other collection points. Unlike backbone cabling, horizontal cabling does not typically carry aggregate traffic and, as such, impacts only single network devices or users. In buildings, horizontal cabling almost exclusively consists of copper cabling. Fiber optic cabling may be used where situations dictate but, unlike horizontal copper cabling, horizontal fiber optic cabling is not installed in advance as default building facilities. At this writing, horizontal copper cabling in many networks is capable of supporting Gigabit (1Gb/s) Ethernet applications as well as other applications of similar bandwidth.

Permanent Link – A stationary cabling segment, consisting of the permanently installed cable and the permanently affixed jack at both ends (typically at the outlet faceplate and closet patch panel, or on a patch panel on both ends). The concept assumes that, while patch cords might be disconnected or moved over time, the permanent cable and jacks will not be disturbed, and the electrical characteristics of the permanent link will remain unaltered.

Plenum – A space within the building designed for the movement of environmental air; i.e., a space above a suspended ceiling or below an access floor.

Raceway - Any channel designed for holding wires or cables; i.e. conduit, electrical metal tubing, busways, wireways, ventilated flexible cableway.

Spine – also called a backbone, the main communications cables in an IDF.

3.1.1.8 27 02 30 *Project Drawings*

- A. **General Drawing Specifications:** Detail and elevation drawings shall be in Digital format- CAD, PDF, Excel, Visio, or another Digital Format approved by the City of Long Beach’s Infrastructure Services Team. ER, TR and other enlarged detail floor plan drawings shall be in Digital format- CAD, PDF, Excel, Visio, or another Digital Format approved by the City of Long Beach’s Infrastructure Services Team.
- B. **Building composite floor plans:** Provide building floor plans showing outlet locations and jack configuration, types of jacks, run distance for each jack cable, and cable routing/locations. Identify TO’s that, according to location and available pathway systems, require cable length greater than allowed by standards. Recommend alternatives for Owners Representative’s consideration.
- C. **Telecommunications space plans/elevations:** Include enlarged floor plans of TRs indicating layout of equipment and devices, including receptacles and grounding provisions. Submit detailed plan views and elevations of telecommunications spaces showing racks, termination blocks, and cable paths.
- D. **Logical Drawings:** Provide logical riser or schematic drawings for all systems. Include schematic symbol key.

3.1.1.9 27 02 50 *Substitutions*

- A. **Substitution requests:** Substitution requests will be considered only if submitted to Owner’s Representative not less than 7 working days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner’s Representatives sole discretion. No exceptions. Requests for substitutions shall be considered not approved unless approval is issued in writing by Owner’s Representative.

- B. **Rejection:** For equipment, cabling, wiring, materials, and all other products indicated or specified as no substitutions or no alternates, Owner does not expect nor desire requests for substitutions and alternate products other than those specified. Owner reserves right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.

3.1.1.10 27 02 65 Warranty

3.1.1.10.1 27 02 65.10 Contractors Warranty

- A. **General requirements:** Comply with additional requirements in contract general requirements and extended warranties required in other specification sections. Refer to all other 27xxx sections for specific additional warranty requirements that exceed or are in addition to those of this section.
- B. **Contractor warranty:** Provide all services, materials and equipment necessary for successful operation of entire telecommunications system and SCS system for a period of one year after system acceptance. Scope of warranty includes all equipment, devices, wiring, accessories, software, hardware, installation, programming, and configuration required to maintain a complete and operable system. Provide manufacturer's published recommended preventative maintenance procedures during warranty period. This shall apply to all items except those specifically excluded, or items wherein a longer period of service and warranty is specified or indicated. All warranties shall be effective for one year, minimum, from date Certificate of Final Acceptance is issued. Use of systems provided under this section for temporary services and facilities shall not constitute final acceptance of work nor beneficial use by Owner and shall not institute warranty period. The warranty shall cover repair or replacement of defective materials, equipment, workmanship, and installation that may be incurred during this period. Warranty work is to be done promptly and to Owner's satisfaction. In addition, warranty shall cover correction of damage caused in making necessary repairs and replacements under warranty. Additional warranty responsibilities are:
1. Obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's designated name. Replace material and equipment that require excessive service during guarantee period as determined by Owner.
 2. Provide 2-business day service beginning on date of Substantial Completion and lasting until termination of warranty period. Service shall be at no cost to Owner. Service can be provided by installing contractor or by a separate service organization. Choice of service organization shall be subject to Owner's approval. Submit name and a phone number that will be answered on a 24-hour basis each day of week, for duration of service.
 3. Submit copies of equipment and material warranties to Owner before final acceptance.
 4. At end of warranty period, transfer manufacturers' equipment and material warranties still in force to Owner.
 5. If warranty work problems cannot be corrected immediately to Owner's satisfaction, advise Owner in writing, describing efforts to correct situation, and provide analysis of cause for problem. If necessary to resolve problem, provide at no cost services of manufacturer's engineering and technical staff at site in a timely manner to analyze warranty issues, and develop recommendations for correction, for review and approval by Owner.
- C. **Owner's rights:** This section shall not be interpreted to limit Owner's rights under applicable codes and under this Contract.
- D. **Pathways Material and Installation warranty:** Provide all services, materials and equipment necessary to warrant the installation and performance of all pathway materials for a period of one year after

beneficial use. Scope of warranty includes all equipment, devices, installation and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

- E. Grounding and Bonding Material and Installation warranty: Provide all services, materials and equipment necessary for successful operation of GBS for a period of one year after beneficial use. Scope of warranty includes all equipment, devices, installation and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.
- F. Firestopping Material and Installation warranty: Provide all services, materials and equipment necessary to warrant the performance of all Firestopping material for a period of one year after beneficial use, or longer if required by the local AHJ. Scope of warranty includes all equipment, devices, installation and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

3.1.1.10.2 27 02 65.20 SCS Manufacturers Extended Warranty

- A. SCS Systems will be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified vendor. Manufacturer shall administer a follow-on program through the Vendor to provide support and service to the purchaser. The first part is an assurance program, which provides that the certified system will support the applications for which it is designed, during the 25-year warranty of the certified system.
- B. The second portion of the certification is a 25-year warranty provided by the manufacturer and the vendor on all products within the system (cords, telecommunications outlet/connectors, cables, cross-connects, patch panels, etc.).
- C. If the certified system ceases to support the certified application(s), whether at the time of cutover, during normal use or when upgrading, the manufacturer and vendor shall commit to promptly implement corrective action.
- D. Documentation proving the cabling system's compliance to the End-to-End Link Performance recommendations, as listed in ANSI/TIA-568-C shall be provided by the Vendor prior to the structured cabling system being installed.
- E. The cabling system must conform to the current issue of industry standard TIA-568. All performance requirements of this document must be followed. As well, workmanship and installation methods used shall be equal to or better than that found in the BICSI (Building Industry Consulting Service International) ITSIM manual.
- F. Purchaser demands strict adherence to the performance specifications listed in ANSI/TIA-568-C series standards.
- G. Manufacturer shall maintain ISO Quality Control registration for the facilities that manufacturer the product used in this cabling system.

3.1.1.11 27 02 67 Completeness of Work

- A. **Complete and usable work:** The contractor is responsible for providing complete and usable work per contract documents. All materials and equipment shall be provided with all accessories and additional work required for field conditions, as well as additional work and accessories required for complete, usable, and fully functional construction and systems, even if not explicitly specified or indicated. Telecommunications system in this Contract shall be provided as complete and operable systems in full

compliance with requirements on drawings and specification requirements. Drawings are diagrammatic, and specifications are performance-based, and Contractor shall provide all work required to comply with drawings and specifications, even if not explicitly indicated or specified. Contractor shall be responsible for coordinating installation of electrical systems with all field conditions and work of other trades. Minimum clearances and work required for compliance with NFPA 70, National Electrical Code® (NEC®), and manufacturer's instructions shall be provided. Comply with additional requirements indicated for access and clearances. Contractor shall verify all field conditions and dimensions that affect selection and provision of materials and equipment, and shall provide any disassembly, reassembly, relocation, demolition, cutting and patching required to provide work specified or indicated, including relocation and reinstallation of existing wiring and equipment. Contractor shall protect from damage resulting from Contractor's operations existing facility, equipment, and wiring. Extra charges for completion and contract time extension will not be allowed because of field conditions or additional work required for complete and usable construction and systems. Comply with additional requirements indicated for access and clearances.

- B. **Drawings and specifications form complementary requirements:** provide work specified and not shown, and work shown and not specified as though explicitly required by both. Except where explicitly modified by a specific notation to contrary, it shall be understood that indication or description of any item, in drawings or specifications or both, carries with it instruction to furnish and install item, provided complete.
- C. **Terms:** As used in this specification, provide means furnish and install. Furnish means "to purchase and deliver to project site complete with every necessary appurtenance and support," and install means "to unload at delivery point at site and perform every operation necessary to establish secure mounting and correct operation at proper location in project."
- D. **Authority approvals:** Give notices, file plans, obtain permits and licenses, pay fees, and obtain necessary approvals from authorities that have jurisdiction as required to perform work per all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.
- E. **Supplementary items:** Provide supplementary or miscellaneous items, appurtenances, devices and materials necessary for a sound, secure and complete installation. Examine project drawings and other Sections of specifications for requirements that affect work of this section. Completely coordinate work of this section with work of other Sections and provide a complete and fully functional installation. Refer to all other drawings and other specifications sections that indicate types of construction in which work shall be installed and work of other sections with which work of this section must be coordinated
- F. **Quantities:** Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

3.1.1.12 27 02 70 *Project Conditions*

- A. **Field verification:** Carefully verify location, use and status of all material, equipment, and utilities that are specified, indicated, or deemed necessary for removal. Verify that all materials, equipment, and utilities to be removed are completely inactive and will not be required or in use after completion of project. Replace with equivalent any material, equipment and utilities that were removed by Contractor that are required to be left in place.

- B. **Existing utilities:** As applicable, do not interrupt utilities serving facilities occupied by Owner or others unless permitted under following conditions and then only after arranging to provide temporary utility services per requirements indicated:
1. Notify owner in writing at least 14 days in advance of proposed utility interruptions. Do not proceed with utility interruptions without Owner's written permission.
 2. Equipment installation:
 - a. Determine suitable path for moving unit substation into place; consider Project conditions.
 - b. Verify clearance requirements and locate equipment to meet installation tolerances.
 - c. Revise locations and elevations from those indicated to those required to suit Project.

3.1.1.13 27 02 73 *Delivery Storage and Handling*

- A. **General:** Contractor shall be responsible for the deliveries, storing and handling of all materials relative to the SCS systems, including materials supplied by others that are part of the SCS installation contract. Material shall be stored and protected per manufacturer's instructions. Contractor shall be responsible for the security of all material during installation. For all material provided by contractor, or delivered to contractor on site, contractor assumes full responsibility and liability for any material shortages, damage or loss due to storage and handling methods.

3.1.1.14 27 02 75 *Permits and Inspections*

- A. **General:** All telecommunications systems shall meet or exceed the latest requirements of all national, state, county, municipal, and other authorities exercising jurisdiction over the telecommunications systems and the Project.
- B. Contractor shall obtain and pay for all licenses, permits, and inspection fees required by local agencies and/or other agencies having jurisdiction.
- C. Contractor agrees to furnish any additional labor or material required to comply with all local and other agencies having jurisdiction at no additional cost.
- D. Contractor shall obtain certificates of inspection and approval from all authorities having jurisdiction, and forward copies of same to Owner's Representative prior to request for Project acceptance inspections, completion inspections, substantial completion inspections, and acceptance testing/demonstrations.
- E. All required permits and inspection certificates shall be made available at the completion of the telecommunications system installation and commissioning.
- F. Any portion of the telecommunications work which is not subject to the requirements of an electric code published by a specific AHJ shall be governed by the National Electrical Code and other applicable sections of the National Fire Code, as published by the National Fire Protection Association (NFPA).
- G. Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Administration (OSHA).

3.1.2 27 04 00 Execution

3.1.2.1 27 04 01 General Requirements

- A. **General:** Sequence, coordinate, and integrate various elements of telecommunications system, materials, and equipment. Comply with following requirements as a minimum.
- B. Coordinate systems, equipment, and materials installation with other building components.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for wiring, cabling, and equipment installations.
- E. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- F. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of Work; give particular attention to large equipment requiring positioning prior to closing in building.
- G. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom and access for service and maintenance as possible.
- H. Coordinate connection of materials, equipment, and systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- I. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by Contract Documents, recognizing that portions of Work are shown only in diagrammatic form. In case of conflict among individual system requirements, request direction in writing from Owner's Representative.
- J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed in both exposed and un- exposed spaces.
- K. Install cabling, wiring, and equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- L. Provide access panel or doors where units are concealed behind finished surfaces.
- M. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- N. Comply with all requirements and work indicated on drawings.
- O. Avoid interference with structure and with work or other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of Owner and per code requirements.
- P. Install equipment and cabling/wiring to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel or roof curbs as appropriate.
- Q. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall and ceiling mounting of equipment as required.
- R. Provide steel supports and hardware for proper installation of hangers, anchors, guides, and other support hardware.
- S. Obtain and analyze catalog data, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.
- T. Structural steel and hardware shall conform to ASTM standard specifications. Use of steel and hardware shall conform to requirements of AISC Code of Practice: Section Five.

- U. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would void warranty.

3.1.2.2 27 04 10 *Equipment Installation*

- A. **General:** Install equipment per manufacturer's written instructions. Install equipment level and plumb. Install wiring and cabling between equipment and all related devices.
- B. **Mounting:** If neither the Owner's Instructions nor the individual section call out the required hardware mounting, use the following.
 1. For equipment at walls, bolt units to wall or mount on structural steel channel strut bolted to wall
 2. For equipment not at walls, provide freestanding CPI racks fabricated of structural steel members and slotted structural steel channel strut
 3. Use feet consisting of 0.25-inch thick steel plates, 6 square inches, bolted to floor
 4. Use feet for welded attachment of vertical posts not over 3 feet on center
 5. Connect posts with horizontal U channel steel strut and bolt control equipment to channels
- C. **Cleaning:** Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.
- D. **Connections:** Tighten wiring connectors, terminals, bus joints, and mountings, to include lugs, screws and bolts per equipment manufacturer's published torque tightening values for equipment connectors. In absence of published connection or terminal torque values, comply with torque values specified in UL 486A and UL 486B.

3.1.2.3 27 04 30 *Cutting and Patching*

- A. **General:** Perform cutting and patching per contract general requirements. In addition, following requirements apply:
 1. Perform cutting, fitting, and patching of electrical equipment and materials required to uncover existing infrastructure to provide access for correction of improperly installed existing or new Work.
 2. Remove and replace defective Work.
 3. Remove and replace Work not conforming to requirements of Contract Documents.
 4. Remove samples of installed Work as specified for testing.
 5. Install equipment and materials in existing structures.
- B. **Demolition and removal:** Cut, remove, and legally dispose of selected equipment, components, and materials as indicated, including but not limited to removal of material, equipment, devices, and other items indicated to be removed and items made obsolete by new Work. Provide and maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.
- C. **Protection of work:** Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. During cutting and patching operations, protect adjacent installations. Patch finished surfaces and building components using new materials specified for original installation and experienced Installers.

3.1.2.4 27 04 50 *Access and Access Panels*

- A. **General:** Provide access to materials and equipment that require inspection, replacement, repair or service. Provide access panels and/or doors as required to allow service of all equipment components. Provide access panels where items installed require access and are concealed in floor, wall, furred space or above ceiling. Ceilings consisting of lay-in or removable splined tiles do not require access panels. Locations of equipment requiring access shall be noted on record drawings. Access panels shall have same fire rating classification as surface penetrated.
1. **Coordination:** Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment and deliver to Owner.
 2. **Construction:** Panels shall be at least 12 inches by 12 inches and located to provide optimum access to equipment for maintenance and servicing. Verify access panel locations and construction with Owner's Representative.

3.1.2.5 27 04 70 *Special Responsibilities and Information*

- A. **Coordination of information:** Cooperate and coordinate with work of other sections in executing work of this section. Perform work such that progress of entire project, including work of other sections, shall not be interfered with or delayed. Provide information as requested on items furnished under this section, which shall be installed under other sections. Obtain detailed installation information from manufacturers of equipment provided under this section.
- B. **Information gathering:** Obtain final rough-in dimensions or other information as needed for complete installation of items furnished under other sections or by Owner. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other sections. Give full information so that openings required by work of this section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at no expense to Owner.
- C. **Housekeeping pads:** Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted equipment
- D. **Maintenance of equipment and systems:** Maintain equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.
- E. **Use of premises:** Use of premises shall be restricted as directed by Owner's Representative and as required below:
1. **Cleaning and rubbish removal:** Remove and dispose of dirt and debris and keep premises clean. During progress of work, remove equipment and unused material. Put building and premises in neat and clean condition and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Owner's Representative.
 2. **Rubbish Removal:** Provide for the removal from the site of all spoils, debris, boxes, packaging, crates, and trash generated from the work.
- F. **Storage:** Store materials maintaining an orderly, clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off ground by means of pallets or racks and covered with tarpaulins.
1. **Protection of fireproofing:**

- A. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, if possible, prior to start of spray fire proofing work.
 - B. Conduits and other items that would interfere with proper application of fireproofing shall be installed after completion of spray fire proofing work.
 - C. Patching and repairing of fireproofing due to cutting or damaging to fireproofing during course of work specified under this section shall be performed by installer of fireproofing and paid for by section responsible for damage and shall not constitute grounds for an extra to Owner.
2. **Temporary utilities:** Refer to contract general requirements regarding requirements.
 3. **Movement of materials:** Unload materials and equipment delivered to site. Pay costs for rigging, hoisting, lowering and moving equipment on and around site, in building or on roof.

3.1.2.6 27 04 80 Division of Work

- A. **General:** Division of work responsibility matrix at the end of this section is for Contractor's reference to clarify roles of various manufacturers, installers, subcontractors, and trades involved in telecommunications system Project.
- B. Contractor holding contract with Owner is responsible for coordinating work of all subcontractors to provide a complete and usable Project complying with contract provisions of Project documents.
- C. Failure to coordinate work by subcontractors and suppliers will not be considered justification for additional compensation or extension of schedule.

Division of work responsibility chart						
Spec. section	System	Contractors				Remarks
		Gen	Elec	Mec	Telecom	
25 xx xx	Building Automation System (BAS)	1	C	C	C	BAS low voltage cabling by Division 15 uses telcom cable tray.
21 xx xx	Fire Detection And Alarm System (FDAS)	1	C	C	C	Completely separate cabling system and raceways by Division 16
26 xx xx	Electrical wiring (line voltage)	1	2,W	C	C	Completely separate cabling system and raceways by Division 16
26 xx xx	Poke-through fittings and floor boxes	1	2, E	C	C	Telcom to provide data jacks and A-V connectors
26 xx xx	Cable tray	1	2, E	C	C	Comply with Section 27 05 28
26 xx xx	Electrical raceways	1	2, E	C	C	Comply with Section 27 05 28
27 02 00	General requirements for telecommunications system	2	C	C	1	
27 10 00	Structured Cabling System (SCS) for telecommunications systems		C	C	1, E, W	
27 05 28	Pathways for telecommunications systems	1	2, P	C	1	
27 05 26	Grounding and Bonding System (GBS) for telecommunications systems	1	2, G	C	1	
27 05 32	Firestopping for telecommunications systems		2, FP	C	1, FC	

1 = primary contractual responsibility
 2 = secondary responsibility
 3 = tertiary responsibility
 C = coordination of work responsibility
 E = provision of specified equipment and devices
 W = provision of specified system wiring/cabling
 P = provision of specified system pathways/conduits
 S = provision of specified system spaces
 FP = provision of specified firestopping for pathways
 FC = provision of specified firestopping for cabling

END OF SECTION

3.1.3 27 05 00 Common Work Results for Communications

3.1.3.1 27 05 26 *Grounding and Bonding for Communications Systems*

1. Reference Documentation

Reference all approved industry standards regarding Grounding and Bonding for Telecommunications racks, cabinets, infrastructure, and electronic specifications

- A. TIA-607-B Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- B. ANSI-J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- C. ANSI J-STD 607-B Commercial Building Grounding (Earthing) and Bonding Requirement for Telecommunications
- D. ANSI/NECA/BICSI 607:2011 BICSI Standard for Telecommunication Grounding & Bonding, Planning and Installation Methods for Commercial Building
- E. NFPA 70:2017 (NEC) National Electrical Code of USA Article 250 & Article 800
- F. ISO/IEC 30129:2015 Information Technology - Telecommunications Bonding Networks for Buildings and Other Structures
- G. IEEE 1100 Recommended Practice for Power and Grounding Electronic Equipment
- H. BICSI Telecommunications Distribution Methods Manual (TDMM), 14th Edition

3.1.3.2 27 05 29 *Hangers and Supports for Communications Systems*

1. GENERAL

1.1. Scope of Work

This Section includes the minimum requirements for the support structures for the Communications Systems for the project as outlined in the Bid Document.

- A. Non-continuous cable supports (2.3A)
- B. Adjustable non-continuous cable support sling (2.3B)
- C. Multi-tiered non-continuous cable support assemblies (2.3C)
- D. Non-continuous cable support assemblies from tee bar (2.3D)
- E. Non-continuous cable support assemblies from drop wire/ceiling (2.3E)
- F. Non-continuous cable support assemblies from beam, flange (2.3F)
- G. Non-continuous cable support assemblies from C & Z Purlin (2.3G)
- H. Non-continuous cable support assemblies from wall, concrete, or joist (2.3H)
- I. Non-continuous cable support assemblies from threaded rod (2.3I)
- J. Raised floor non-continuous cable support assemblies (2.3J)
- K. Cantilever-Mounted Option for non-continuous cable supports (2.3K)
- L. Installation accessories for non-continuous cable supports (2.3L)

1.2. Submittals

- A. Submit product data on non-continuous cable support devices, including attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

1.3. Quality Assurance

- A. Non-continuous cable support and cable support assemblies shall be listed by Underwriters Laboratories for both Canadian and US standards (cULus).
- B. Non-continuous cable supports shall have the manufacturers name and part number stamped on the part for identification.
- C. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience in the industry, and certified ISO 9000.

1.4. Coordination

- A. Coordinate installation of hangers, supports, and cables with other trades.

2. PRODUCTS

2.1. Acceptable Manufacturers

- A. Subject to compliance with these specifications, non-continuous cable supports shall be as manufactured by: CPI Chatsworth, B-Line, CADDY, HILTI, or equal

2.2. References

ANSI/TIA-568 Commercial Building Telecommunications Cabling Standard
ANSI/TIA-569 Telecommunications Pathways and Spaces
ASTM B633 Standard Specification for Electro-Deposited Coatings of Zinc on Iron and Steel
ASTM B 695-90 Standard Specification for coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A109 Standard Specification for Steel, Strip, Carbon, Cold-Rolled
ASTM A167 Standard Specification for Stainless and heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A480/A480M Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low- Alloy Hot-Rolled and Cold-Rolled
A653 G60-Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy- coated (Galvannealed) by the Hot-Dip process
ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar

ASTM A682 Standard Specification for Steel, Strip, High-Carbon, Cold-Rolled, Spring Quality

ASTM A879 Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

ASTM B117 Standard Method of Salt Spray (Fog) Testing

ASTM D610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces

UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

NFPA 70 National Electrical Code®

2.3. Non-continuous Cable Support Systems

A. Non-continuous cable supports

1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed
2. Non-continuous cable supports shall have flared edges to prevent damage while installing cables
3. Non-continuous cable supports sized 1-5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces
4. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments
5. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply

B. Adjustable non-continuous cable support sling

1. Constructed from steel and woven laminate; sling length can be adjusted to hold up to 425 4-pair UTP; rated for indoor use in non-corrosive environments. Rated to support Category 5e and higher cable, or optical fiber cable; cULus Listed.
2. Adjustable non-continuous cable support sling shall have a static load limit of 100 lbs.
3. Adjustable non-continuous cable support sling shall be suitable for use in air handling spaces
4. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.

C. Multi-tiered non-continuous cable support assemblies

1. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.
2. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.

D. Non-continuous cable support assemblies from tee bar

1. Tee bar support bracket with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

E. Non-continuous cable support assemblies from drop wire/ceiling

1. Fastener to wire/rod with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

F. Non-continuous cable support assemblies from beam, flange

1. Fastener to beam or flange with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
- G. Non-continuous cable support assemblies from C & Z Purlin
 1. Fastener to C or Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed
- H. Non-continuous cable support assemblies from wall, concrete, or joist
 1. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed
- I. Non-continuous cable support assemblies from threaded rod
 1. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed
 2. The multi-tiered support bracket shall have a static load limit of 300 lbs.
 3. U-hooks and Double J-hook shall attach directly to threaded rod using standard nuts
- J. Raised floor non-continuous cable support assemblies
 1. Fastener to raised (access) floor pedestal with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments; cULus Listed
- K. Cantilever-Mounted cable supports
 1. U-hook shall be able to be assembled to a wide variety of wall mount brackets.
 - ~~2~~ Spacing of individual U-hooks shall be spaced to prevent cables from sagging or buckling.
 3. U-hooks may have the optional attachment of a cable roller for ease in pulling cables
- L. Installation accessories for non-continuous cable supports
 1. Cable Pulley
 - a. Non-continuous cable supports may be used as an installation tool when a removable pulley assembly is included. The pulley shall be made of plastic and be without sharp edges. The pin and bail assembly must be able to be secured to the J-Hook during cable installation. The pulley must remain secured while cables are being pulled.
 - b. The pin and roller assembly must be removed after cables are installed.
 2. Cable Protector
 - a. The protective steel tube shall fit over threaded rod and be at least 4" in length.
 - b. The tube shall prevent damage to cables placed in or pulled through CAT- CMTM U-hooks. The tube shall not inhibit the pulling of cables.

2.4. Finishes

- A. ASTM B633 Standard Specification for Electro-Deposited Coatings of Zinc on Iron and Steel
- B. ASTM B 695 Standard Specification for coatings of Zinc Mechanically Deposited on Iron and Steel
- C. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- D. ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- E. Non-continuous cable supports used where only mildly corrosive conditions apply shall be stainless steel, AISI type 304.

3. EXECUTION

3.1. Installation

- A. Installation and configuration shall conform to the requirements of the current revision levels of TIA Standards 568 and 569, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer's installation instructions.
- B. Do not exceed load ratings specified by manufacturer.
- C. Adjustable non-continuous support sling shall have a static load limit of 100 lbs.
- D. Follow manufacturer's recommendations for allowable fill capacity for each size non- continuous cable support.
- E. Locate pathways per Telecommunications Drawings.

END OF SECTION

3.1.3.3 27 05 32 *Firestopping for Telecommunications Systems*

1. GENERAL

1.1. Scope:

This SECTION describes the requirements for furnishing and installing firestopping for fire-rated construction. This includes all openings in fire-rated floors, walls and other rated elements of construction, both blank (empty) and those accommodating items such as cables, conduits, pipes, ducts, etc.

- A. Fireblocking for Concrete Floor or Wall Sleeved Cables.
- B. Fireblocking for Gypsum Wall Sleeved Cables.
- C. Fireblocking for Concrete Block Wall Sleeved Cables.

1.2. Related Documents:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 7 Specification Sections, apply to this Section.
- B. Cable fill calculations must be included to show the maximum cable fill ratio for each Firestopping System and cable type.

1.3. References:

ANSI/TIA 569 - Telecommunications Pathways and Spaces

ANSI/NFPA 70 - National Electrical Code (NEC)

ASTM E-814 - Fire Tests of Through-Penetration Fire Stops

ASTM E-119 - Fire Tests of Building Construction and Materials BOCA - Basic/National Building Code

NFPA 101 - Life Safety Code ICBO - Uniform Building Code

SSBCCI - Standard Building Code

UL 1479 - Fire Tests of Through-Penetration Firestops

UL Fire Resistance Directory - Penetration Firestops System (XHE2) and Fill, Void or Cavity Materials

END OF SECTION

3.1.3.4 27 05 36 *Cable Trays for Communications Systems*

1. GENERAL

1.1. Scope

- A. Continuous, rigid, welded steel or stainless-steel wire mesh cable management system.
- B. Cable tray systems are defined to include, but are not limited to, straight sections, supports and accessories.

1.2. Related Documents:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3. Summary

References:

- ANSI/NFPA 70 – National Electrical Code (NEC)
- ANSI/TIA-569 - Telecommunications Pathways & Spaces
- ASTM A 510 - Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
- ASTM A 380 – Specification for Standard Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems
- ASTM B 633 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- ASTM A 123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- IEC 61537 (2001) – Cable Tray Systems and Cable Ladder Systems for Cable Management
- NEMA VE 1-2002/CSA C22.2 No. 126.1-02 – Metal Cable Tray Systems

END OF SECTION

3.1.3.5 27 05 53 *Identification for Communications Systems*

1. GENERAL

1.1. Scope of Work

This Section includes the minimum requirements for the Identification and labeling of the Communications Systems for the project as outlined in the Bid Document.

1.2. Summary

- A. Administration of the telecommunications infrastructure includes documentation of cables, termination hardware, patching and cross-connection facilities, conduits, other cable pathways, Telecommunications Rooms, and other telecommunications spaces. All facilities shall apply and maintain a system for documenting and administering the telecommunications infrastructure. All documentation must be in Digital format- CAD, PDF, Excel, Visio, or another Digital Format approved by the City of Long Beach Telecommunications Team.
- B. The owner maintains a campus wide labeling scheme for voice and data outlets and patch panels.
- C. Industry Labeling Standards and Conventions shall be used unless otherwise stated in the bid documents or by the Owner's Representative.
- D. Telecommunications Infrastructure Records must be maintained in a computer spreadsheet, or in a computer database. Documentation must be in Digital format- CAD, PDF, Excel, Visio, or another Digital Format approved by the City of Long Beach's Infrastructure Services Team.
- E. A cable record is prepared for each backbone cable. The record will show the cable name and must describe the origin point and destination point of the cable. The cable record will record what services and/or connections are assigned to each cable pair or strand. An equipment record is prepared for services distributed from a certain piece of equipment, such as a router, or a system such as the telephone system PBX.
- F. Installer shall maintain accurate, up-to-date Installation or Construction Drawings. At a minimum, the Installation Drawings shall show pathway locations and routing, configuration of telecommunications spaces including backboard and equipment rack configurations, and wiring details including identifier assignments.
- G. Installer shall provide a complete and accurate set of as-built drawings and must be in Digital format- CAD, PDF, Excel, Visio, or another Digital Format approved by the City of Long Beach's Infrastructure Services Team.
- H. The as-build drawings shall record the identifiers for major infrastructure components including; the pathways, spaces, and wiring portions of the infrastructure which may each have separate drawings if warranted by the complexity of the installation, or the scale of the drawings.

1.3. Quality Assurance

- A. All labels shall be installed in a neat and workmanlike manner. All methods of labeling that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative.

- B. Labels shall be of the quality and manufacture indicated. The labels and labeling equipment specified are based upon the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- C. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data labeling.
- D. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

TIA-606-C Administration Standards for Telecommunications Infrastructure

TIA-569 Telecommunications Pathway and Spaces

TIA-568 Telecommunications Cabling Standard

BICSI Telecommunications Distribution Methods Manual

UL 969 - UL Standard for Safety for Marking and Labeling Systems

1.4. Submittals

- A. Provide product data for the following:
 - 1. Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

1.5. Coordination

- A. Coordinate installation of labels with other trades.
- B. Storage and Handling: Avoid breakage, denting and scoring finishes. Damaged products will not be installed. Store materials in original cartons and in a clean dry space; protect from weather and construction traffic. Wet materials will be unpacked and dried before storage.

2. PRODUCTS

2.1. Labels

- A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969
- B. Shall be preprinted or computer printed type. Hand written labels are not acceptable
- C. Where insert type labels are used provide clear plastic cover over label
- D. Outside plant labels shall be totally waterproof even when submerged
- E. Equipment Room Copper, Fiber, and Coax Backbone Cable Labels
- F. Equipment Room Copper, Fiber, and Coax Horizontal Cable Labels
- G. Work Area Copper, Fiber, and Coax Riser Cable Labels
- H. Patch Panel Labels

3. EXECUTION

3.1. Identification & Labeling

- A. The City of Long Beach Telecommunications Division will specify labeling and identification on a per job basis, following the project award to the vendor/contractor.

- B. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.
- C. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.
- D. All labels shall be printed or generated by a mechanical device.

3.2. Telecommunication Identifiers

- A. Refer to the University of Houston Information Technology Telecommunications Infrastructure Standards Manual for labeling practices
- B. Outside Plant cabling shall be clearly marked using permanent means. Outside plant shall use the following system of numbering and labeling:
 - 1. Fiber Optic:
 - a. Identify: far-end building name, building number, fiber-type and strand-count
 - b. Label at entrance and exit points of tunnel system and at conduit entry points between 12 inches and 36 inches from the conduit or at closet point that is clearly visible and long cable length in tunnel at 200-foot intervals.
 - c. Label at termination panels at both ends
 - 2. Copper:
 - a. Identify: far-end building name, building number and strand-count
 - b. Label at entrance and exit points of tunnel system and at conduit entry points between 12 inches and 36 inches from the conduit or at closet point that is clearly visible and long cable length in tunnel at 200-foot intervals
- C. Riser cabling shall be clearly marked using permanent means. Riser cabling shall use the following system of numbering and labeling:
 - 1. Fiber Optic:
 - a. Identify: far-end EF / ER / TR, fiber-type and strand-count.
 - b. When small facilities are fed from a primary location and treated as an ER, riser shall be labeled similar to Outside Plant Fiber Optic
 - 2. Copper:
 - a. Identify: far-end EF / ER / TR and pair-count
 - b. Termination points shall be labeled as to actual pair at every fifth (5th) pair-point.

3.3. Labeling Procedures

- A. To be consistent with ANSI/TIA standards and industry practices, it is important that both labeling and color coding be applied to all telecommunications infrastructure components. Labeling with the unique identifier will identify a particular component. Proper color coding will quickly identify how that component is used in the overall telecommunications infrastructure of the facility.
- B. Visibility and durability:
 - 1. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.

2. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light) and should have a design life equal to or greater than that of the labeled component.
 3. Labels are generally of either the adhesive or insert type. All labels must be legible, resistant to defacement, and maintain adhesion to the application surface.
 4. Outside plant labels shall be totally waterproof, even when submerged.
 5. Labels applied directly to a cable shall have a clear vinyl wrapping applied over the label and around the cable to permanently affix the label.
 6. Other types of labels, such as tie-on labels, may be used. However, the label must be appropriate for the environment in which it is used and must be used in the manner intended by the manufacturer.
- C. Mechanical generation
1. All labels shall be printed or generated by a mechanical device.
 2. Hand written labels are NOT acceptable.

END OF SECTION

3.1.4 27 10 00 Structured Cabling

3.1.4.1 27 10 10 General Requirements

- A. Transmission performance of structured cabling varies with length, connecting hardware, cords and total number of connections. The installer must take care to properly install the cabling components. To ensure that the installed structured cabling solution meets or exceeds the required performance it must be 'tested' or 'certified'.
- B. The requirements for each category of cabling (CAT6, or CAT6A) and optical fiber optics links are located in the ANSI/TIA-568 series standards.
- C. Test equipment must meet the requirements set forth in the ANSI/TIA-568 series Standard for Field Test Equipment. All Copper testers shall be Level III. All fiber testers shall meet the requirements in ANSI/TIA-568.
- D. Field Power Meters shall meet the following:
 - Accuracy ± 0.2 dB
 - Resolution 0.01 dB
 - Precision ± 0.15 dB
- E. The Field light source shall meet the following:
 - Accuracy ± 0.01 dB
 - Wavelength 850 ± 30 nm
 - 1300 ± 50 nm
 - 1310 ± 30 nm
 - 1550 ± 30 nm
- F. The calibration on all test equipment shall be current.
- G. The software in all test equipment shall be current.

3.1.4.2 27 10 10 Manufacturers

The following manufacturer's testers are approved.

- A. FLUKE
 - 1. MultiFiber Pro
 - 2. DTX-CLT CertiFiber Optical Loss Test Set
 - 3. DSX
 - 4. Versiv
- B. Ideal
 - 1. LanTEK II
- C. Viavi
 - 1. Certifier
 - 2. SmartClass Fiber OLTS
- D. EXFO
 - 1. MAXTester
 - 2. FTB720
- E. Or other test equipment approved by CommScope

3.1.4.3 27 10 20 Systems Testing and Documentation

3.1.4.3.1 27 10 20.01 General Requirements

- A. Provide installation testing of equipment where required by manufacturer's installation instructions.
- B. Provide complete end to end testing for all copper and fiber optic systems/channels based on latest applicable standards. Document all testing and submit with final as-built submittal package. All documentation for systems testing must be in digital format.
- C. For all controls and operating equipment, submit equipment/systems to at least three complete operational sequences, in which all equipment operations are tested, observed, and verified.
- D. Prior to substantial completion and project acceptance inspection, submit test reports to indicated scope of startup and operational tests, with results of testing for each specified operation. Such test results must be in digital format including if required the test equipment's native format.

3.1.4.3.2 27 10 20.10 Copper Cabling System Testing

- A. **General:** Copper cabling shall be tested and certified after installation as follows and as required for cable manufacturer's warranty. Twisted-pair copper cable channels shall be tested for continuity as specified below, presence of ac/dc voltage, and performance. All cabling shall be tested for conformance to horizontal cable specifications as outlined herein and shall be tested per test set manufacturer's instructions utilizing latest firmware and software. Testing shall include all electrical parameters as specified under Product. All cables and termination hardware shall be 100 percent tested by installation contractor for defects in installation and to verify cable performance under installed conditions. All conductors of each installed cable shall be verified useable by Contractor prior to system acceptance. All cables shall be tested per contract documents, manufacturer's warranty provisions, and best industry practices. If any of these are in conflict, Contractor shall comply with most stringent requirements. All defects in cabling system installation shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed, at no additional cost to Owner.
- B. **Continuity:** Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. The test shall be recorded as pass/fail as indicated by test unit per manufacturers recommended procedures and referenced to appropriate cable identification number and circuit or pair number. Any faults in wiring shall be corrected and cable re-tested prior to final acceptance.
- C. **Length:** Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to maximum distances set forth in ANSI/TIA-568-C standards and all other applicable standards specified in Appendix 1: Codes, Standards, and Informative References. Cable lengths shall be recorded, referencing cable identification number and circuit or pair number. For multi-pair cables, shortest pair length shall be recorded as length for cable.
- D. **Factory testing:** Every reel of cable shall be tested by cable manufacturer for all characteristics specified for cable type in this section. This testing shall be performed using a sweep test method and include frequencies specified for cable. A test report shall be available electronically, at no additional cost, for a minimum of five (5) years from the date of manufacture. The test report shall include the reel number, the date of the test, the Lot number, and test results for Return Loss (RL), Insertion Loss

(Attenuation), Pair-to-Pair NEXT, and Power Sum NEXT Pair-to-Pair ELFEXT and Power Sum ELFEXT. The test report shall show the "Worst Case Margin" for the listed transmission characteristics.

- E. **Test results:** Test results shall be automatically evaluated by equipment, using most up- to-date criteria from TIA-568-C standards and all other applicable standards specified in Appendix 1: Codes, Standards, and Informative References, and result shown as pass/fail. Test results shall be printed directly from test unit or from a download file using an application from test equipment manufacturer. The printed test results shall include all tests performed, expected test result and actual test result achieved.
- F. **Test reports:** Test reports for all factory testing and field test reports for copper cabling installation shall be submitted to the Owner's Representative and manufacturer prior to commissioning voice and data system and final contract payment. Refer to Submittals in this Section. Test results must be in digital format and if required in the test equipment's native format.
- G. Cable Shall have Online WebTrak Report System Certification capability. For UTP copper cables, include Near End Crosstalk (NEXT), Power Sum Crosstalk (PSNEXT), Equal Level Far End Crosstalk (ELFEXT), Power Sum Equal Level Far End Crosstalk (PSELFEXT), Return Loss, Impedance, Attenuation and propagation delay. For optical fiber cables results to include cable construction and attenuation data for each optical fiber at two (2) test wavelength.

3.1.4.3.3 27 10 20.20 Optical Fiber Cable Testing

- A. **General:** Optical fiber cabling shall be tested and certified after installation as described below and as required for cable manufacturer's warranty. Fiber testing shall be performed on all fibers in completed end to end system. Testing shall consist of a bi-directional end to end test in accordance with applicable standards in 27 02 20.20, or a bi-directional end to end test performed by TIA-455-53A and all other applicable standards in 27 02 20.20. The system loss measurements shall be provided at 850 and 1300 nanometers for multimode type glass and 1310 and 1550 nanometers for single-mode type glass. These tests shall also include continuity checking of each fiber. For spans greater than 90 meters, each tested span must test to a value less than or equal to value determined by calculating a link loss budget. For horizontal spans less than or equal to 90 meters, each tested span must be less than or equal to 2.0 decibels. The insertion loss for each mated optical fiber connector pair shall not exceed 0.40 decibels.
- B. **Pre-installation testing:** Test all optical fiber cable for all fibers prior to installation of cable.
- C. **Performance testing:** Where links are combined to complete a circuit between devices, Contractor shall test each link from end to end to ensure performance of system. Only a basic link test is required. Contractor can optionally install patch cords to complete circuit and then test entire channel. The test method shall be same used for test described above. The values for calculating loss shall be those defined in applicable TIA standards.
- D. **Attenuation testing:** Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach test equipment to cable plant. The light source shall be left in place after calibration and power meter moved to far end to take measurements.
- E. **Loss budget:** All fiber cabling shall be tested at both wavelengths 850 nm and 1310 nm for multimode and 1300 nm and 1550 nm for single mode.
 - 1. The link attenuation shall be calculated using:
 - a. The following calculation for other installations:
$$\text{Link Attenuation Allowance (dB)} = \text{Cable Attenuation (dB)} + \text{Connector loss (dB)} + \text{Splice Insertion Loss (dB)}$$

Where:

Cable attenuation (dB) = Cable attenuation (dB/km) X Length (km)

Connector loss (dB) = Number of Connector pairs X Allowable connector loss

(dB) Splice Insertion Loss (dB) = Number of Splices X Allowable Splice loss (dB)

2. **Link loss:** A mated connector to connector interface shall be considered a single connector. Loss numbers for installed link shall be calculated by taking sum of bi- directional measurements and dividing that sum by two. All links not meeting requirements of standard shall be brought into compliance by Contractor, at no additional cost to Owner.
3. **Documentation:** Final documentation shall be submitted to the owner's representative prior to commissioning data system and final contract payment according to Submittals in this section. Documentation must be in digital format.
4. **Test results:** Test results shall be automatically evaluated by equipment, using most up-to-date criteria from all applicable standards specified in 27 02 20.20 and result shown as pass/fail. Test results shall be printed directly from test unit or from a download file using an application from test equipment manufacturer. The printed test results shall include all tests performed, expected test result and actual test result achieved. Documentation must be in digital format.
5. **End to End Loss Data:** final documentation shall be submitted to the owner's representative. Documentation must be in digital format.
6. **As Installed/ As Built Diagrams:** Final documentation shall be submitted to the owner's representative. Documentation must be in digital format.

3.1.4.3.4 27 10 20.30 Test Documentation

A. Electronic Format is required

1. Certification Test Reports shall be submitted in electronic format using the appropriate software supplied by the test equipment manufacturer. The data format should be that of the test report software (i.e. *.flw files for Fluke). The contractor shall provide any necessary software to view and evaluate the test data.
2. The following list is provided as a reference:

<u>Tester</u>	<u>Test Report Software</u>
Fluke	LinkWare™
Ideal	LanTek® Reporter

3. One electronic copy of the Test Reports shall be provided.

END OF SECTION

3.1.5 27 11 00 Communications Equipment Room Fittings

3.1.5.1 27 11 16 Communications Racks

1. GENERAL

1.1. Scope of Work

- A. This section includes the minimum requirements for the equipment and cable installations in communications equipment rooms (Telecommunications Closets).
- B. Included in this section are the minimum composition requirements and installation methods for the following:
 - 1. Communication Racks and Rack Cable Management

1.2. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- B. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling
- C. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

- ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard,
- ANSI/TIA-569 Telecommunications Pathways and Spaces,
- ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure
- ANSI-J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- EIA-310-E, Cabinets, Racks, Panels, and Associated Equipment (most recent version)
- NFPA 70 National Electric Code
- BICSI Telecommunications Distribution Methods Manual

1.3. Submittals

- A. The City of Long Beach has standardized on Chatsworth Products for the said items and substitutions will not be accepted without written approval from the City of Long Beach Telecommunications personnel at least 5 days before the project bid due date
 - 1. Racks and Cable Managers
 - 2. Cabinets (Floor and Wall)

3. Pathways (Cable Runway and/or Wire Basket)
 4. Grounding
 5. Industrial/NEMA Rated Enclosures
- B. Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid)

2. PRODUCTS

2.1 General

A. RACKS

1. Racks shall be manufactured from aluminum and/or steel extrusion.
2. Each rack will have two L-shaped top angles, two L-shaped base angles and two C-shaped equipment-mounting channels. The rack will assemble with nut and bolt hardware. The base angles will be pre-punched for attachment to the floor.
3. Equipment mounting channels will be punched on the front and rear flange with the EIA-310 Universal Mounting hole pattern.
 - a. Aluminum Racks will be threaded with 12-24 roll-formed threads and will include 40 each combination pan head, pilot point mounting screws.
 - b. Steel Racks will have 3/8" square holes and will include 40 each #12-24 x 1/2" mounting screws and 40 each #12-24 cage nuts.
4. The rack will include assembly and equipment-mounting hardware.
5. The rack will be rated:
 - a. Four-Post Racks: 2,000 lb. (907.2 kg) of equipment ← preferred
 - a. Chatsworth (CPI) 4-post rack: 15053-703
 - b. Two-Post Racks: 1,000 lb. (453.6 kg) of equipment ← to be discussed based on clearance
 - a. Chatsworth (CPI) 2-post rack: 55053-703
6. The rack will be UL Listed
7. When assembled with top and bottom angles, equipment-mounting channels will be spaced to allow attachment of 19" EIA rack-mount equipment.
8. RACK CABLE MANAGEMENT
 - a. Vertical cable management shall have doors that are lightweight, sturdy, and be available in different sizes to allow flexibility in design.
 - b. The cable management system shall have a C-Channel bracket that allows for easy access to the cable trough.
 - c. The vertical cable management system shall allow tool-less installation of Cable Spool.
 - d. Doors shall come standard with on all cable management and be available in both single- and double-sided configurations.
 - e. The door shall have dual hinge design that can be opened to the right or left.
 - f. The door latching mechanism shall have an easy closing feature.
 - g. The door shall have one-point removal and installation process for door.
 - h. Horizontal wire managers: The door shall have horizontal cover hinges up or down and be lockable into position with cylindrical finger ends for easy snap on installation
 - i. The door shall have a recessed handle to eliminate snag potential for clothes and arms.

- j. The Horizontal cable management system shall have an open back on 2U and 3U horizontal troughs for easy pass-through of cables
 - a. Manufacturers:
 - i. Chatsworth (CPI)
 - ii. Panduit

END OF SECTION

27 11 19 Communications Termination Blocks and Patch Panels

1. GENERAL

1.1. Work Includes

- A. Provide all labor, material, and equipment for the complete installation of work called for in the Contract Documents.

1.2. Scope of Work

- A. This section includes the minimum requirements for Horizontal and Backbone cable terminations installed in communications equipment rooms (Telecommunications Rooms, Equipment Rooms, or "Telecommunications Closets").
- B. Included in this section are the minimum composition requirements and installation methods for the following:
 - 1. Patch Panels

1.3. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- B. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- C. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard

ANSI/TIA-569 Telecommunications Pathways and Spaces

ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure

BICSI - Telecommunications Distribution Methods Manual

CENELEC EN-50173 - Generic cabling systems

ISO/IEC 11801 - Generic cabling for customer premises

J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

NFPA 70 National Electric Code

1.4. Submittals

- A. Provide product data for the following:

Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

2. PRODUCTS

2.1. Patch Panels

A. Category 5e/Class D Patch Panels – **for existing reference only; all new installations require CAT6 or CAT6A**

1. General specifications: Patch panel shall be constructed of high strength steel with black powder finish and designed for wall or 19-inch rack mounting.
2. Panels shall be available in 24-port and 48-port configurations, with height of 1 Rack Unit (RU) of 44.5 millimeters (1.75 inches) for each group of 24 ports.
3. Removable rear mounted cable management bar and front and rear identification labels.
4. Panel shall support 1 Gb network line speeds.
5. Panel shall be Category 5 and 3 backward compatible.
6. Panel shall comply with the standards for Category 5e/Class D patch panels listed in the TIA-568 Series Standards and ISO/IEC 11801.
7. Panel shall support IEEE 802.3 1000BASE-T plus other legacy LANs and applications.
8. Refer to Appendix 2: CommScope Part Numbers
9. Approved Manufacturer:
 - a. CommScope SYSTIMAX Patch Panels

[Category 5e Universal Panels CPP-5E-DM-1U-24 \(760180000\)](#)

[Category 5e Universal Panels 1100-U-PS-24 \(760182907\)](#)

[Category 5e Universal Panels CPP-5E-DM-2U-48 \(760180018\)](#)

[Category 5e Universal Panels 1100-U-PS-48 \(760182915\)](#)

B. Category 6/Class E Patch Panels

1. General specifications: Patch panel shall be constructed of high strength steel with satin chrome finish and designed for wall or 19-inch rack mounting.
2. Panels shall be available in 24-port and 48-port configurations, with height of 1 Rack Unit (RU) of 44.5 millimeters (1.75 inches) for each group of 24 ports.
3. Removable rear mounted cable management bar and front and rear identification labels.
4. Patch panels must be capable of connection to the CommScope Intelligent Patching solution or upgradable to connection to the CommScope Intelligent Patching Solution.
5. Patch panels shall support 5-meter cables in 3 and 4 connector channels, 3-meter cables in 2 connector channels and cross connect cords down to 1 meter.
6. Comply with the standards for Category 6/Class E patch panels listed in the TIA- 568 Series Standards and ISO/IEC 11801.
7. Refer to Appendix 2 CommScope Part Numbers
8. Approved Manufacturer:
 - a. CommScope SYSTIMAX Patch Panels

[360-IPR-1100-E-GS3-1U-24 \(760152561\)](#) GigaSPEED XL Cat 6 U/UTP, 24 port
[360-IPR-1100-E-GS3-2U-48 \(760152579\)](#) GigaSPEED XL Cat 6 U/UTP, 48 port

b. CommScope SYSTIMAX Angled Patch Panels

[360-IPR-1100A-E-GS3-1U-24 \(760151308\)](#) GigaSPEED XL Angled Cat 6 U/UTP, 24 port
[360-IPR-1100A-E-GS3-2U-48 \(760151753\)](#) GigaSPEED XL Angled Cat 6 U/UTP, 48 port

C. Category 6A/Class EA Patch Panels

1. General specifications: Patch panel shall be constructed of high strength steel with satin chrome finish and designed for wall or 19-inch rack mounting.
2. Panels shall be available in 24-port and 48-port configurations, with height of 1 Rack Unit (RU) of 44.5 millimeters (1.75 inches) for each group of 24 ports.
3. Removable rear mounted cable management bar and front and rear identification labels.
4. Patch panels must be capable of connection to the CommScope Intelligent Patching solution or upgradable to connection to the CommScope Intelligent Patching Solution.
5. Patch panels shall support 5-meter cables in 3 and 4 connector channels, 3-meter cables in 2 connector channels and cross connect cords down to 1 meter.
6. Comply with the standards for Category 6A/Class EA patch panels listed in the TIA-568 Series Standards and ISO/IEC 11801.
7. Refer to Appendix 2: CommScope Part Numbers
8. Approved Manufacturer:
 - a. CommScope SYSTIMAX Patch Panels

[360-IPR-1100-E-GS6-1U-24 \(760152587\)](#) GigaSPEED X10D Category 6A U/UTP, 24 port
[360-IPR-1100-E-GS6-2U-48 \(760152595\)](#) GigaSPEED X10D Category 6A U/UTP, 48 port

b. CommScope SYSTIMAX Angled Patch Panels

[360-IPR-1100A-E-GS6-1U-24 \(760151324\)](#) GigaSPEED X10D Ang Cat 6A U/UTP, 24 port
[360-IPR-1100A-E-GS6-2U-48 \(760151779\)](#) GigaSPEED X10D Ang Cat 6A U/UTP, 48 port

D. High Density CAT6A and CAT6 Modular Patch Panels

1. General specifications: Patch panel shall be constructed of high strength steel with black powder finish and designed for wall or 19-inch rack mounting.
2. Panels shall be available in a 48-port configuration, with height of 1 Rack Unit (RU) of 44.5 millimeters (1.75 inches).
3. Panel shall be designed for CommScope Category 6 and 6A Information Outlets.
4. Removable rear mounted cable management bar and front and rear identification labels.
5. Refer to Appendix 2: CommScope Part Numbers
6. Approved Manufacturer:
 - a. CommScope Patch Panel

[M4800-1U-GS \(760105429\)](#) 1U Modular Panel, 48 port, Cat 6A and 6 Info Outlets
[M2400-1U-GS \(760118323\)](#) 1U Modular Panel, 24 port, Cat 6A and 6 Info Outlets

b. CommScope Blank Modular CAT6 and CAT6A Panels

360-E-MOD-2U-48 ([760187195](#)) 2U SYSTIMAX 360™ Evolve 48-port flat panel

360-E-MOD-1U-24 ([760187187](#)) 1U SYSTIMAX 360™ Evolve 24-port flat panel

3. EXECUTION

3.1. Installation

- A. All Patch Panels shall be installed in the racks installed in the telecommunications space.
- B. Each patch panel shall be attached to the rack using the four (4) rack screws supplied with the panel
- C. All Patch Panels shall be installed level and plum within the racks.
- D. Patch Panels shall be installed per the elevation drawings for the Telecommunications space.

END OF SECTION

3.1.6 27 13 00 Communications Backbone Cabling

3.1.6.1 27 13 13 Communication Copper Backbone Cabling

1. GENERAL

1.1. Work Includes

Provide all labor, materials, and equipment for the complete installation of all voice backbone applications called for in the Contract Documents. Provide sufficient pair count to support 100% expansion at the outlet locations.

1.2. Scope of Work

- A. This section includes the minimum requirements for Inter and Intra Building Copper Backbone Cables.
- B. Included in this section are the minimum composition requirements and installation methods for the following:
 - Intra-Building Backbone (Inside buildings (ISP))
 - Inter-Building Backbone (Between buildings (OSP))

1.3. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- B. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- C. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:
 - TIA-568 Series Commercial Building Telecommunications Cabling Standard,
 - TIA-569 Telecommunications Pathways and Spaces,
 - TIA-606 Administration Standard for the Telecommunications Infrastructure
 - ANSI-J-STD - 607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - NFPA 70 - National Electric Code
 - BICSI - Telecommunications Distribution Methods Manual

1.4. Submittals

- A. Cable Manufacturer's data, including part numbers, cut sheets and detailed descriptions, for all proposed equipment
The Contractor shall submit installation plan indicating:
 - 1. Equipment and personnel

2. Materials and staging area
 3. Start and completion dates
 4. Locations, including floor, room and building
- B. The Contractor shall submit a copper cable pulling plan for all multi-pair copper cables with a pair count of 25 pairs or greater, that includes, but is not limited to, the following:
1. Each cable run and route.
 2. Date and duration of the pull.
 3. Pulling methodology and equipment setups.
 4. Pulling tension calculations for each pull in the run.
 5. Safety issues and precautions to be taken.
- C. Product data for all termination and test equipment to be used by Contractor to perform work.
1. Equipment shall be calibrated with traceability to National Institute of Standards and Technology (NIST) requirements.
 2. Contractor shall include copy of calibration and certification that equipment calibration meets NIST standards and has been calibrated at least once in the previous calendar year.
- D. Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

2. EXECUTION

2.1. Installation

- A. General - Inter and Intra Building Copper Backbone Cable
1. Contractor shall comply applicable codes, standards and with all local codes and requirements. It is the responsibility of the contractor to identify and adhere to any unique codes or requirements governed by the region where the work is to be performed.
 2. Provide all necessary products for installation of Copper Backbone cablings to include cable attachments, etc.
 3. Backbone cable shall be installed following industry standard practices.
 4. All Outside Plant Backbone cable shall terminate on Primary protection (per the NEC) upon entering the building.
 5. All installations shall comply with:
 - ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard ANSI/TIA-569 Telecommunications Pathways and Spaces
 - ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - BICSI – Telecommunications Distribution Methods Manual
 - J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding
 - Requirements for Telecommunications NFPA 70 – National Electric Code
- B. Backbone Cable Testing
1. Complete end-to-end test results for all copper UTP cables installed are required.
 2. All multi-pair copper cable pairs installed shall be tested to TIA-568A, Category 6 equivalent performance specifications. In addition, provide loop resistance measurements in ohms and dB loss at 1KHz, 8KHz, and 256KHz.

3. The Owner is to be notified at least 24 hours prior to testing to allow observation at the Owner's discretion. If the Owner confirms his intention to observe, a reasonable starting time shall be agreed upon. Should the Owner not be present at the scheduled commencement time, the Contractor may begin testing as scheduled.
 4. 100% of all pairs in backbone copper cables shall be tested for continuity and wire-map.
 5. Testing Format: Test Results must be submitted in two (2) formats. First, must be original file(s) down loaded from tester. Second, the file must be cohesively placed in Excel format with the following fields:
ER/TR RM # / RM # of drop / Port # / all relevant test information in as many fields as necessary.
 6. All test results are to be recorded and submitted to the Owner.
- C. Cable and Termination Panel Labeling
Label the installed cables in accordance with Section 27 05 53
- D. Cable Support
1. Provide cable supports and clamps to attach cables to backboards and walls.
 2. Attach horizontal and vertical backbone cables at 2-foot intervals using Owner approved supports; such as D-rings or jumper troughs utilized for wire management.
 3. Attach cables to manhole racks using Owner approved methods
 4. Backbone cabling shall be secured to the cable/ladder tray following manufacturer recommended procedures, and appropriate installation hardware and methods as defined by local code or the authority having jurisdiction (AHJ).
- E. As-built Drawings
1. CAD Files: Provide CAD files in dwg or dgn formats showing floor plans with room numbers and actual backbone cabling and pathway locations and labeling. The deliverable is required within 5 business days of final cable testing.
 2. Red Line Drawings: Contract must keep one (1) E size set of floor plans on site during work hours showing installation progress marked and backbone cable labels noted. Contractor may be asked to produce these drawings for examination during construction meetings or field inspections.

END OF SECTION

3.1.7 27 15 00 Communications Horizontal Cabling

3.1.7.1 27 15 13 Communication Copper Horizontal Cabling

1. GENERAL

1.1. Work Includes

Provide all labor, materials, and equipment for the complete installation of all Copper Horizontal Cabling applications called for in the Bid Documents.

1.2. Scope of Work

- A. This section includes the minimum requirements for Copper Horizontal Cables.
- B. Horizontal (to desktop) cable shall consist of Category 6 or 6A copper cable for all Data and Voice applications.
- C. At corporate, engineering and campus facilities, horizontal cabling to typical work area outlets (including offices, cubicles and conference rooms) shall consist of two (2) Category 6 cables serving each outlet.
- D. Outlets for wall-mounted or other "telephone only" installations shall consist of one Category 6 cable as a minimum.
- E. Outlets for wireless access points (APs) shall consist of two Category 6A cables as a minimum.

1.3. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- B. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- C. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and

ANSI/TIA-569 Telecommunications Pathways and Spaces

ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure

ANSI-J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

BICSI – Telecommunications Distribution Methods Manual Components Standards

NFPA 70 – National Electric Code

ISO/IEC 11801 - Generic Cabling for Customer Premises
CENELEC EN-50173 - Generic Cabling Systems

1.4. Cable Construction (by Type):

- A. Listed CMR cable: Solid copper conductors with high-density polyolefin insulation and an overall low smoke polyvinyl chloride (PVC) jacket to achieve a riser (i.e., non-plenum) rating by applicable NEC requirements.
- B. Listed CMP cable: Solid copper conductors with fluorinated ethylene propylene (FEP) insulation and an overall low smoke PVC jacket to achieve plenum rating by applicable NEC requirements.
- C. LSZH cable: Solid copper conductors with non-halogen high-density polyethylene (HDPE) insulation and a low smoke, zero halogen, compound jacket to achieve a LSZH rating by applicable IEC standards
- D. LC cable: Solid copper conductors with FEP fluoropolymer insulation and overall FEP fluoropolymer jacket to achieve CMP 50 rating by UL standards
- E. OSP outdoor cable rated for wet locations: Solid copper conductors with polyethylene insulation, polyolefin fluted center member with flooding compound, and black polyethylene jacket
- F. Comply with following general physical specifications:
 - 1. Maximum pulling tension: 110 Newton's (25 pound-force)
 - 2. Operating temperature: -20 to 60 degrees C [-4 to 140 degrees F]

1.5. Submittals

Provide product data for the following:

Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

1.6. Coordination

Coordinate layout and installation of cable tray with other trades.

2. PRODUCTS

2.1. Data Communications Horizontal & Backbone High-Count 25 Pair Cabling (Category 5E)

- A. All Cables shall be of round construction
- B. Each cable shall contain 25 color coded pairs
- C. Cable shall be listed for the environment where it will be installed (Plenum, Riser, LSZH, etc.)
- D. Refer to Appendix 2: CommScope Part Numbers
- E. Approved Manufacturer:
 - 1. 874020906/10- CommScope CS24 Category 5E 25-Pair Cable
 - 2. 884021305/10 - CommScope CS24 Category 5E 25-Pair Cable

F. Cable shall meet the Electrical Specifications herein:

Electrical Specifications

ANSI/TIA Category	5e
Characteristic Impedance	100 ohm
dc Resistance Unbalance, maximum	5 %
dc Resistance, maximum	9.38 ohms/100 m
Delay Skew, maximum	15 ns
Dielectric Strength, minimum	1500 Vac 2500 Vdc
Mutual Capacitance at Frequency	5.6 nF/100 m @ 1 kHz
Nominal Velocity of Propagation (NVP)	71 %
Operating Frequency, maximum	100 MHz
Operating Voltage, maximum	80 V
Remote Powering	Fully complies with the recommendations set forth by IEEE 802.3bt (Type 4) for the safe delivery of power over LAN cable when installed according to ISO/IEC 14763-2, CENELEC EN 50174-1, CENELEC EN 50174-2 or TIA TSB-184-A
Transmission Standards	ANSI/TIA-568-C.2 CENELEC EN 50288-3-1 ISO/IEC 11801 Class D
Safety Voltage Rating	300 V

Freq. MHz	IL	NEXT	ACR	PSNEXT	PSACR	ACRF	PSACRF	RL
	Std	Std	Std	Std	Std	Std	Std	Std
1	2.0	65.3	63.3	62.3	60.3	63.8	60.8	20.0
4	4.1	56.3	52.2	53.3	49.2	51.8	48.8	23.0
8	5.8	51.8	46.0	48.8	43.0	45.7	42.7	24.5
10	6.5	50.3	43.8	47.3	40.8	43.8	40.8	25.0
16	8.2	47.2	39.0	44.2	36.0	39.7	36.7	25.0
20	9.3	45.8	36.5	42.8	33.5	37.8	34.8	25.0
25	10.4	44.3	33.9	41.3	30.9	35.8	32.8	24.3
31.25	11.7	42.9	31.2	39.9	28.2	33.9	30.9	23.6
62.5	17.0	38.4	21.4	35.4	18.4	27.9	24.9	21.5
100	22.0	35.3	13.3	32.3	10.3	23.8	20.8	20.1

1. General specifications: Cable shall have UTP configuration, round overall cable geometry, and pairs of #24 AWG (0.511 millimeters). Provide specified or indicated cable type. Cable color shall be specified or selected by Owner’s Representative from manufacturer’s standard colors.
2. Comply with following cable construction specifications by type:
 - a. UL-listed CMR cable: Solid copper conductors with high-density polyolefin insulation and an overall low smoke PVC jacket to achieve riser (i.e., non-plenum) rating by UL standards
Approved product:
CommScope Solutions CS24 Category 5E 25-Pair Cable
 - b. NFPA 262 listed CMP cable: Solid copper conductors with FEP insulation and overall low smoke PVC jacket to achieve plenum rating by NFPA 262
3. Comply with following general physical specifications:
 - a. Maximum pulling tension: 110 newtons (25 pounds-force)
 - b. Operating temperature: -20 to 60 degrees C (-4 to 140 degrees F)
4. Comply with following cable performance specifications:
 - a. Data shall be guaranteed performance for worst-case channels utilizing 4-pair series cables with full cross-connects, CPs, and work area outlets (i.e., 4 connectors in a channel) for length up to 100 meters (328 feet).
5. Cable geometry, and pairs of #24 AWG (0.511 millimeters).

- a. Cable pair counts shall be as follows:
- b. 25, 50, 100, 200, 300, 400, 600, 900, 1200, 1500, and 1800.
- c. Provide specified or indicated cable type.
- d. Cable color shall be dark grey.

G. High-pair count riser cable

1. General specifications: Cable shall have UTP configuration, round overall cable geometry, and pairs of #24 AWG (0.511 millimeters).
 - a. Cable pair counts shall be as follows:
25, 50, 100, 200, 300, 400, 600, 900, 1200, 1500, and 1800.
 - b. Provide specified or indicated cable type.
 - c. Cable color shall be dark grey.
2. Comply with following general physical specifications:
 - a. UL-listed CMR cable: Solid copper conductors with high-density polyolefin insulation and overall low smoke PVC jacket to achieve a riser (i.e., non-plenum) rating by UL standards
 - b. Comply with following general physical specifications:
 1. Maximum pulling tension: 110 newtons (25 pounds-force)
 2. Operating temperature: -20 to 60 degrees C (-4 to 140 degrees F)
3. Comply with following cable performance specifications. Data shall be guaranteed performance for worst-case channels utilizing 4-pair series cables with full cross-connects, CPs, and work area outlets (i.e., 4 connectors in a channel) for length up to 100 meters (328 feet).

2.2. Data Communications Horizontal Cabling (Category 6/Class E)

A. Category 6/Class E Unshielded Twisted-Pair (UTP) Cable

1. All Cables shall be of round construction
2. Each cable shall contain 4 color coded pairs
3. Cable shall be listed for the environment where it will be installed, and available options shall include Plenum, Riser, LSZH, Outdoor, Indoor/Outdoor versions.
4. Refer to Appendix 2: CommScope Part Numbers
5. Approved Manufacturer:
 - a. CommScope SYSTIMAX GigaSPEED XL CAT6

PLENUM	
Product #	Material ID
2071E LB 4/23 W1000	760191833
2071E BL 4/23 W1000	700208093
2071E WH 4/23 W1000	700208101
2071E YL 4/23 W1000	700210123
2071E SL 4/23 W1000	700214372
2071E OR 4/23 W1000	700210024

NON-PLENUM	
Product #	Material ID
1071E LB 4/23 W1000	700211964
1071E BL 4/23 W1000	760004689
1071E WH 4/23 W1000	700212046
1071E YL 4/23 W1000	700211998
1071E SL 4/23 W1000	700211931
1071E OR 4/23 W1000	700212103

2071E LL 4/23 W1000	700210214
2071E RD 4/23 W1000	700210263
2071E BK 4/23 W1000	700210230
2071E SG 4/23 W1000	700210164

1071E LL 4/23 W1000	700212095
1071E RD 4/23 W1000	700212020
1071E BK 4/23 W1000	700212129
1071E SG 4/23 W1000	700212061

b. CommScope Indoor/Outdoor CAT6 CS34P-IO

[CS34P-IO \(874049304/10\)](#) Category 6 U/UTP 4/23 Indoor/Outdoor, BLACK

c. CommScope SYSTIMAX Outdoor OSP CAT6

[1571A BK 4/24 R1000 \(760008888\)](#) Category 6 GigaSPEED XL® U/UTP OSP, BLACK
[1571A BK 4/24 R3000 \(760090043\)](#) Category 6 GigaSPEED XL® U/UTP OSP, BLACK

- B. Category 6 horizontal cabling shall provide the following Margin to the specification when installed in a 4 connector Channel:

Electrical Parameter (1-250MHZ)	Guaranteed Margins to Category 6 Class E Channel Specifications
Insertion loss	5%
NEXT	6 dB
PSNEXT	7.5 dB
ELFEXT	6 dB
PSELFEXT	8 dB
Return Loss	4 dB

- C. Category 6 horizontal cabling shall meet or exceed the performance specifications listed in the following table when installed in a 4 connector Channel.

Guaranteed Channel Performance Specifications for 4-Connection GigaSPEED XL7 U/UTP Systems										
Freq (MHz)	Insertion Loss (dB)	NEXT (dB)	ACR (dB)	PSNEXT (dB)	PSACR (dB)	ELFEXT (dB)	PSELFEXT (dB)	Return Loss (dB)	Delay (ns)	Delay Skew (ns)
1.0	2.0	71.0	69.0	69.5	67.5	69.3	68.3	23.0	580	30

4.0	3.8	69.0	65.2	68.0	64.2	57.2	56.2	23.0	562	30
8.0	5.4	64.2	58.8	63.1	57.7	51.2	50.2	23.0	557	30
10.0	6.0	62.6	56.6	61.5	55.5	49.3	48.3	23.0	555	30
16.0	7.6	59.2	51.6	58.1	50.4	45.2	44.2	22.0	553	30
20.0	8.6	57.6	49.1	56.5	47.9	43.2	42.2	21.5	552	30
25.0	9.6	56.0	46.4	54.8	45.2	41.3	40.3	21.0	551	30
31.25	10.8	54.4	43.6	53.2	42.4	39.4	38.4	20.5	550	30
62.5	15.6	49.4	33.7	48.1	32.4	33.3	32.3	18.0	549	30
100.0	20.2	45.9	25.7	44.6	24.3	29.3	28.3	16.0	548	30
200.0	30.0	40.8	10.8	39.4	9.4	23.2	22.2	13.0	547	30
250.0	34.1	39.1	5.0	37.7	3.5	21.3	20.3	12.0	546	30

1. The table provides reference values only. All parameters comply with the governing equations over the entire frequency range.
 2. All values and equations apply to worst-case channels utilizing four-pair 71E series cables with full cross-connects, consolidation points and work area outlets (4 connectors in a channel) for any channel lengths up to 100 meters.
- D. Category 6 horizontal cabling shall provide the following Margin to the specification when installed in a 6 connector Channel

Electrical Parameter (1-250MHZ)	Guaranteed Margins to Category 6 Class E Channel Specifications
Insertion loss	4%
NEXT	4 dB
PSNEXT	5.5 dB
ELFEXT	4 dB
PSELFEXT	6 dB
Return Loss	2 dB

- E. Category 6 horizontal cabling shall meet or exceed the performance specifications listed in the following table when installed in a 6 connector Channel.

Guaranteed Channel Performance Specifications for 6-Connection GigaSPEED XL7 U/UTP Systems
--

Freq (MHz)	Insertion Loss (dB)	NEXT (dB)	ACR (dB)	PSNEXT (dB)	PSACR (dB)	ELFEXT (dB)]	PSELFEXT (dB)	Return Loss (dB)	Delay (ns)	Delay Skew (ns)
1.0	2.1	69.0	66.9	67.5	65.4	67.3	66.3	21.0	580	30
4.0	3.9	67.0	63.2	66.0	62.1	55.2	54.2	21.0	562	30
8.0	5.4	62.2	56.7	61.1	55.7	49.2	48.2	21.0	557	30
10.0	6.1	60.6	54.5	59.5	53.4	47.3	46.3	21.0	555	30
16.0	7.7	57.2	49.5	56.1	48.4	43.2	42.2	20.0	553	30
20.0	8.7	55.6	47.0	54.4	45.8	41.2	40.2	19.5	552	30
25.0	9.7	54.0	44.3	52.8	43.1	39.3	38.3	19.0	551	30
31.25	10.9	52.4	41.5	51.2	40.3	37.4	36.4	18.5	550	30
62.5	15.8	47.4	31.6	46.1	30.3	31.3	30.3	16.0	549	30
100.0	20.4	43.9	23.5	42.6	22.1	27.3	26.3	14.0	548	30
200.0	30.3	38.8	8.5	37.4	7.1	21.2	20.2	11.0	547	30
250.0	34.5	37.1	2.6	35.7	1.2	19.3	18.3	10.0	546	30

1. The table provides reference values only. All parameters comply with the governing equations over the entire frequency range.
2. All values and equations apply to worst-case channels utilizing four-pair 71E series cables with up to 6 embedded connections in a channel for any channel lengths up to 100 meters.

2.3. Data Communications Horizontal Cabling (Category 6A/Class EA)

A. Category 6 Augmented (6A)/Class EA Unshielded Twisted-Pair (UTP) Cable

1. All Cables shall be of round construction
2. Each cable shall contain 4 color coded pairs
3. Cable shall be listed for the environment where it will be installed, and available options shall include Plenum, Riser, LSZH, Outdoor, Indoor/Outdoor versions.
4. Refer to Appendix 2: CommScope Part Numbers
5. Approved Manufacturer:
 - a. CommScope SYSTIMAX GigaSPEED X10D

PLENUM	
Product #	Material ID
2091B LB 4/23 W1000	760154039
2091B BL 4/23 W1000	760107201

NON-PLENUM	
Product #	Material ID
1091B LB 4/23 W1000	760107102
1091B BL 4/23 W1000	760107094

2091B WH 4/23 W1000	760107268
2091B YL 4/23 W1000	760107276
2091B SL 4/23 W1000	760107250
2091B OR 4/23 W1000	760107227
2091B PK 4/23 W1000	760118497
2091B RD 4/23 W1000	760107243
2091B BK 4/23 W1000	760185900
2091B GR 4/23 W1000	760107219

1091B WH 4/23 W1000	760107144
1091B YL 4/23 W1000	760107151
1091B SL 4/23 W1000	760107078
1091B OR 4/23 W1000	760107128
1091B PK 4/23 W1000	760188276
1091B RD 4/23 W1000	760107136
1091B BK 4/23 W1000	760107086
1091B GR 4/23 W1000	760107110

b. CommScope Indoor/Outdoor CAT6A CS44P-IO

CS44P-IO ([874036404/10](#)) Category 6A U/UTP 4/23 Indoor/Outdoor, BLACK

c. CommScope SYSTIMAX OSP F/UTP CAT6A

1592A BK 4/24 R1000 ([760178129](#)) 1592A Category 6A F/UTP Cable, outdoor, black jacket, aluminum tape

B. Category 6A horizontal cabling shall provide the following Margin to the specification when installed in a 4 connector Channel.

Electrical Parameter (1-250MHZ)	Guaranteed Channel Margins to Amendment 1 to ISO/IEC 11801:2002 "Class EA"
Insertion loss	3%
NEXT	3 dB
PSNEXT	5 dB
ACR-N	5 dB
PSACR-N	6.5 dB
ACR-F	6 dB
PSACR-F	8 dB
Return Loss	1 dB
Return Loss, PSANEXT, PSAACR-F, Avg. PSANEXT, Avg. PSAACR-F	2 dB

C. Category 6A horizontal cabling shall meet or exceed the performance specifications listed in the following table when installed in a 4 connector Channel.

Guaranteed Channel Performance Specifications for 4-Connection GigaSPEED 360X10D U/UTP Systems														
Freq (MHz)	Insertion Loss (dB)	PS ANEXT (dB)	Avg. PS ANEXT (dB)	PS AACR-F (dB)	AVG. PS AACR-F (dB)	NEXT (dB)	ACR-N (dB)	PS NEXT (dB)	PS ACR-N (dB)	ACR-F (dB)	PS ACR-F (dB)	Return Loss (dB)	Delay (ns)	Delay Skew (ns)
1	2.2	82.0	84.3	79.0	83.0	75.7	73.5	75.3	73.1	69.3	68.3	20.0	580	40
4	4.0	76.0	78.2	67.0	71.0	66.0	62.0	65.5	61.5	57.2	56.2	20.0	562	40
8	5.6	73.0	75.2	60.9	64.9	61.2	55.5	60.6	55.0	51.2	50.2	20.0	557	40
10	6.3	72.0	74.3	59.0	63.0	59.6	53.3	59.0	52.7	49.3	48.3	20.0	555	40
16	7.9	70.0	72.2	54.9	58.9	56.2	48.3	55.6	47.7	45.2	44.2	19.0	553	40
20	8.9	69.0	71.2	53.0	57.0	54.6	45.7	54.0	45.1	43.2	42.2	18.5	552	40
25	9.9	68.0	70.3	51.0	55.0	53.0	43.1	52.3	42.4	41.3	40.3	18.0	551	40
31.3	11.1	67.0	69.3	49.1	53.1	51.4	40.3	50.7	39.6	39.3	38.3	17.5	550	40
62.5	15.9	64.0	66.3	43.1	47.1	46.4	30.5	45.6	29.7	33.3	32.3	15.0	549	40
100	20.3	62.0	64.3	39.0	43.0	42.9	22.7	42.1	21.8	29.3	28.3	13.0	548	40
200	29.2	57.5	59.7	33.0	37.0	37.8	8.6	36.9	7.7	23.2	22.2	10.0	547	40
250	32.9	56.0	58.3	31.0	35.0	36.1	3.2	35.2	2.3	21.3	20.3	9.0	546	40
300	36.2	54.8	57.1	29.5	33.5	34.7	-1.5	33.8	-2.5	19.7	18.7	8.2	546	40
400	42.3	53.0	55.2	27.0	31.0	32.6	-9.8	31.6	-10.8	17.2	16.2	7.0	546	40
500	47.8	51.5	53.8	25.0	29.0	30.9	-17.0	29.8	-18.0	15.3	14.3	7.0	546	40

1. The table provides reference values only. All parameters comply with the governing equations over the entire frequency range.
2. All values and equations apply to worst-case channels utilizing four-pair 91A series cables with full cross-connects, consolidation points and work area outlets (4 connections in a channel) for the length up to 100 meters.

3. EXECUTION

3.1. Installation

- A. Contractor shall comply applicable codes, standards and with all local codes and requirements. It is the responsibility of the contractor to identify and adhere to any unique codes or requirements governed by the region where the work is to be performed.
- B. Cable shall be installed following industry standard practices.
- C. Horizontal cabling shall be installed from the work area outlet location to the nearest Telecommunications Space.

- D. Horizontal cabling shall be terminated on a patch panel in the telecommunication space which is the same category rating as the Cable. i.e. CAT6 cable terminates on CAT6 panels.
- E. Contractor shall not exceed the maximum pulling tension or the minimum bending radius for twisted pair cables per manufacturer's specifications.
- F. Contractor shall test all horizontal links per the ANSI/TIA-568 Requirements.

END OF SECTION

3.1.7.2 27 15 43 *Communications Faceplates and Connectors*

3.1.7.2.1 27 15 43.10 **Communications Copper Jack/Information Outlets and Connectors**

1. GENERAL

1.1. Work Includes

Provide all labor, materials, and equipment for the complete installation of all Jack/Information outlets and connections called for in the Bid Documents.

1.2. Scope of Work

- A. This section includes the minimum requirements for Jack/Information outlets and Connectors.
- B. The channel performance for the installation shall meet or exceed the requirements of ANSI/TIA-568 and ISO/IEC 11801 for the specified Category.
- C. The Jack/Information outlets shall match the category of the cabling
- D. All jacks/information outlets shall meet UL 94 V-O

1.3. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative.
- B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- C. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- D. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

ANSI/ICEA S-87-640, Standard for Optical Fiber Outside Plant Communications Cable

ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard

ANSI/TIA-569 Telecommunications Pathways and Spaces,

ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure

BICSI Telecommunications Distribution Methods Manual

Bellcore, fiber distributed data interface (FDDI) standards

J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding
Requirements for Telecommunications

NFPA 70 National Electric Code

Telcordia Generic Requirements for Optical Fiber and Optical Fiber Cable ISO/IEC 11801

CENELEC EN-50173

1.4. Submittals

Provide product data for the following:

Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

1.5. Coordination

Coordinate installation of Jack/Information outlets and connectors with other trades.

2. PRODUCTS

2.1. General

- A. All products will be compliant to RoHS 2002/95/EC
- B. All products will be designed, manufactured and/or distributed under this quality management system: ISO 9001:2008
- C. Telecommunications jacks shall be 8-position/8-conductor modular outlets accepting industry standard modular RJ45 type plugs and insulation displacement conductor (IDC) terminations.
- D. The Universal design shall support T568B wiring and shall have universal wiring labels, including color-coded insert identification labels to ensure accurate identification.
- E. Color shall be specified or selected by Owner's Representative from manufacturer's standard colors.
- F. Provide crosstalk cancellation with compensation and alien crosstalk mitigation using printed wiring board materials and compensation technology.
- G. Jack shall be backward compatible with lower category cords and cables.
- H. Low-profile wire cap shall protect against contamination and secure connection. Jacks shall be suitable for:
 - 1. Modular patching applications or as modular TO
 - 2. Installation without special faceplates at either 45- or a 90-degree angle in manufacturer's modular faceplates and frames, including those on surface-mounted boxes
- I. Dimensions
 - 1. Depth: 30.48 mm (1.20 in)
 - 2. Height: 20.32 mm (0.80 in)
 - 3. Width: 20.32 mm (0.80 in)
- J. Electrical Specifications
 - 1. Contact Resistance Variation, maximum: 20 mOhm
 - 2. Contact Resistance, maximum: 100 mOhm
 - 3. Current Rating: 1.5 A @ 20 °C, 1.5 A @ 68 °F
 - 4. Dielectric Withstand Voltage, RMS, conductive surface: 1500 Vac @ 60 Hz
 - 5. Dielectric Withstand Voltage, RMS, contact-to-contact: 1000 Vac @ 60 Hz
 - 6. Insulation Resistance, minimum: 500 MOhm
- K. Environmental Specifications
 - 1. Flammability Rating: UL 94 V-0
 - 2. Operating Temperature: -10 °C to +60 °C (+14 °F to +140 °F)
 - 3. Relative Humidity: Up to 95%, non-condensing
 - 4. Safety Standard: cUL, UL
 - 5. Storage Temperature: -40 °C to +70 °C (-40 °F to +158 °F)
- L. Mechanical Specifications

1. Conductor Type: Solid, Stranded (7 strands)
2. Material Type: Copper alloy, High-impact, flame retardant, thermoplastic
3. Outlet/Module Contact Plating: Precious metals
4. Plug Insertion Life, minimum: 750 times
5. Plug Insertion Life, test plug: IEC 60603-7 compliant plug
6. Plug Retention Force, minimum: 30 lbf, 133 N
7. Rear Termination Contact Plating: Precious metals
8. Rear Termination Type: IDC
9. Wiring: T568B
10. Can be mounted either at 90 degrees (straight) or 45 degrees (angled)
11. Angled feature eliminates the need for special faceplates

2.2. Category 5 Enhanced (5e)/Class D Outlets

- A. Pair splitters and wider channel for enhance conductor placement and termination
- B. Optional Plastic Icons (M61A) and Dust Covers (M20A) available in several colors
- C. Backward compatible with Category 5 and 3 cords
- D. Refer to Appendix 2: CommScope Part Numbers
- E. Approved Manufacturer:
 1. CommScope SYSTIMAX

Color	Single	
Blue	MPS100E-318	108232778
Yellow	MPS100E-123	108232711
Gray	MPS100E-270	108232752
White	MPS100E-262	108232745
Orange	MPS100E-112	108232703

Color	Single	
Green	MPS100E-226	108232729
Ivory	MPS100E-246	108232737
Violet	MPS100E-361	108337726
Red	MPS100E-317	108232760
Black	MPS100E-003	108232695

2.3. Category 6/Class E Outlets

- A. GigaSPEED® XL MGS400 Series Category 6 U/UTP Information Outlet
- B. Electrical performance guaranteed to meet or exceed TIA-568-C.2 Category 6 and ISO/IEC Category 6/Class E specifications.
- C. Optional Plastic Icons (M61A) and Dust Covers (M20A) available in several colors
- D. Backward compatible with Category 5e, 5 and 3 cords and cables, however optimal performance achieved when used with GigaSPEED XL GS8E patch cords.
- E. Can support network line speeds in excess of 1 gigabit per second.
- F. Qualifies for a 25-year product and applications assurance warranty when included as part of a certified SYSTIMAX GigaSPEED XL channel.
- G. Universal design and shall support T568B wiring
- H. Refer to Appendix 2: CommScope Part Numbers
- I. Approved Manufacturer:
 1. CommScope SYSTIMAX

Color	Single	
Blue	MGS400-318	700206758
Yellow	MGS400-123	700206691
Gray	MGS400-270	700206733
White	MGS400-262	700206725
Orange	MGS400-112	700206683
Almond	MGS400-148	760074211

Color	Single	
Green	MGS400-226	700206709
Ivory	MGS400-246	700206717
Violet	MGS400-361	700206675
Red	MGS400-317	700206741
Black	MGS400-003	700206667
Cream	MGS400-215	760070326

2.4. Category 6 Augmented (6A)/Class EA Outlets

- A. GigaSPEED® X10D MGS600 Series Information Outlet
- B. Patented crossing of straddling pair contacts enables efficient alien crosstalk reduction in the channel.
- C. Optional Plastic Icons (M61A) and Dust Covers (M20A) available in several colors.
- D. Optimal performance is achieved when using the GigaSPEED X10D 360GS10E patch cords; however, the MGS600 is fully backwards compatible.
- E. Can support network line speeds up to at least 10 gigabits per second.
- F. Qualifies for the SYSTIMAX 25-Year Extended Product Warranty and Applications Assurance when included as part of a registered SYSTIMAX GigaSPEED X10D channel.
- G. Refer to Appendix 2: CommScope Part Numbers
- H. Approved Manufacturer:
 - 1. CommScope SYSTIMAX

Color	Single	
Blue	MGS600-318	760092452
Yellow	MGS600-123	760092387
Gray	MGS600-270	760092437
White	MGS600-262	760092429
Orange	MGS600-112	760092379

Almond	MGS600-148	760092478
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Color	Single	
Green	MGS600-226	760092403
Ivory	MGS600-246	760092411
Violet	MGS600-361	760092460
Red	MGS600-317	760092445
Black	MGS600-003	760092361
Cream	MGS600-215	760092395

3. EXECUTION

3.1. Installation

- A. Contractor shall comply applicable codes, standards and with all local codes and requirements. It is the responsibility of the contractor to identify and adhere to any unique codes or requirements governed by the region where the work is to be performed.
- B. Jack/Information outlets and Connectors shall be installed following industry standard practices.
- C. Horizontal cabling shall be terminated on a Jack/Information outlet which is the same category rating as the Cable. i.e. CAT6 cable terminates on CAT6 Jack/Information outlets.
- D. Contractor shall not exceed the maximum pulling tension or the minimum bending radius for twisted pair cables per manufacturer's specifications.
- E. Contractor shall test all horizontal links per the ANSI/TIA-568 Requirements.

END of SECTION

3.1.7.2.2 27 15 43.25 Work Area Faceplate/Wall Plates and Surface Mount Boxes

1. GENERAL

1.1. Work Includes

Provide all labor, materials, and equipment for the complete installation of all Faceplate/wall plates and Surface mount Boxes called for in the Bid Documents.

1.2. Scope of Work

- A. This section includes the minimum requirements for Faceplate/wall plates and Surface mount Boxes.
- B. All Faceplates and Surface Mount boxes shall be constructed of high-impact, flame retardant; UL rated 94 V-0 Thermoplastic.
- C. Faceplates and SMB shall be designed to accept the CommScope SYSTIMAX information outlets.
- D. Number of outlets per faceplate shall be as detailed on the Telecommunications Drawings.

1.3. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative.
- B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- C. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- D. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards

ANSI/TIA-568-C.3 – Optical Fiber Cabling Components Standard

ANSI/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces

ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure

BICSI-Telecommunications Distribution Methods Manual

CENELEC EN-50173 - Generic Cabling Systems

ISO/IEC 11801 - Generic Cabling for Customer Premises

J-STD-607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

NFPA 70 – National Electric Code

1.4. Submittals

Provide product data for the following:

Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

1.5. Coordination

Coordinate installation of Faceplate/wall plates and Surface mount Boxes with other trades.

2. PRODUCTS

2.1. Faceplates and Surface Mount Boxes (SMB)

A. Refer to Appendix 2: CommScope Part Numbers

B. Approved Manufacturer:

(Following Catalog Number/Part numbers are provided as examples, see CommScope representative for assistance in selecting the proper faceplates and SMBs)

Faceplate physical specifications

Product number	Port configuration	Port quantity	Port orientation	Box gang quantity	Available styles
Flush mounted modular faceplates—flat edge LE Series					
M10LE	simplex	1	NA	1	black
M12LE	duplex	2	horizontal	1	creme
M13LE	triplex	3	vertical	1	ivory
M14LE	quadplex	4	square	1	white
M16LE	sixplex	6	vertical	1	gray
Flush mounted modular faceplates—beveled edge L Series					
M10L	simplex	1	NA	1	black
M12L	duplex	2	horizontal	1	electrical ivory
M13L	triplex	3	vertical	1	electrical white
M14L	quadplex	4	square	1	electrical gray
M16L	sixplex	6	vertical	1	
M28L	eightplex	8	horizontal	2	
M10LW	(wall phone) simplex	1	NA	1	electrical ivory
M10LW	(wall phone) simplex	1	NA	1	electrical white
M12AP	duplex	2	vertical	1	electrical ivory
M12AP	duplex	2	vertical	1	electrical white
Flush mounted modular faceplates—flat edge M Series					
M13FP	single gang frame	NA	NA	1	black
M26FP	double gang frame	NA	NA	2	ivory
M30FP-1RJ45	single port adapter	1	NA	NA	white
M30FP-2RJ45	double port adapter	2	horizontal	NA	gray
M30FP-SVHS	flush mount S-VHS adapter	1	NA	NA	
M30FP-3RCA	3-port RCA adapter	3	horizontal	NA	
M30FP-VGA-PT	VGA adapter	1	NA	NA	
M30FP-BLANK	blank adapter	blank	NA	NA	
Flush mounted modular faceplates—stainless steel					
M12SP	duplex	2	horizontal	1	brushed stainless steel
M13SP	triplex	3	vertical	1	
M14SP	quadplex	4	square	1	
M16SP	sixplex	6	vertical	1	

Faceplate physical specifications

Product number	Port configuration	Port quantity	Port orientation	Box gang quantity	Available styles
Flush mounted multimedia faceplate base					
M10MMFP	base—optical fiber				black
M105FR1	simplex	1	NA	1	black
M106FR2	duplex	2	vertical	1	electrical ivory
M108FR3	triplex	3	vertical	1	electrical white
M106FR4	quadplex	4	square	1	electrical gray
Flush mounted outlet with protective hood					
M14MMO	quadplex	4	square	1	black electrical ivory electrical white electrical gray
Furniture faceplates—generic					
M62C	sixplex	6	horizontal	NA	electrical ivory
M4CA	quadplex	4	square	NA	black-white ivory-gray
Furniture faceplates—manufacturer standards					
M13	triplex	3	horizontal	NA	black electrical ivory/white/gray
M13CLS	triplex—optical fiber (steelcase)	3	horizontal	NA	ivory-white-gray
M13HM	triplex—optical fiber (steelcase) (Herman-Miller)	3	horizontal	NA	black-misty creme black-white ivory-gray
M14C	quadplex—knoll	4	horizontal	NA	black-gray-almond
M14CE	quadplex—steelcase	4	horizontal	NA	black-white
M14CH	quadplex—Herman-Miller	4	square	NA	ivory-gray
Mounting colors					
M30MC	simplex	1	NA	NA	black electrical ivory electrical white electrical gray
M30CC	simplex	1	MN	NA	ivory

2.2. Dust Covers for Faceplates

- A. Dust Covers shall be dual purpose blank covers designed for use with modular outlets and faceplates. They shall be used to cover the outlet opening of all empty faceplate openings and unpopulated jacks to protect the wires from collecting dust.
- B. Refer to Appendix 2: CommScope Part Numbers
- C. Approved Manufacturer:
(Following Catalog Number/Part numbers are provided as examples, see CommScope representative for assistance in selecting the proper faceplates)
 - 1. CommScope

[M20AP-246 107067860 Ivory cover for empty faceplate openings](#)

[M21A-246 108066457 Ivory cover for unpopulated jacks](#)

2.3. 110 Wiring Blocks

A. General: Comply with following specifications for 110-style wiring blocks:

1. Construction: Hardware shall be made of fire-retardant molded plastic and consist of horizontal index strips for terminating 25 pairs of conductors each. Index strips shall be marked with 5 colors on high teeth, separating tip and ring of each pair, to establish pair location. Series of fanning strips shall be located on each side of block for dressing able pairs terminated on adjacent index strips.

B. Approved product:

SYSTIMAX Solutions 110 Wiring Blocks

1. Performance: Hardware shall support category 5, category 5e, category 6, and category 6a applications and facilitate cross connection and interconnection using either cross connect wire (voice only) or appropriate category patch cords.
2. Conductors: Accommodate 22 to 26 AWG conductors.
3. Mounting: Mount directly on wall surfaces with or without backboard or 24-inch free-standing frame.
4. Labeling: Clear label holders with appropriate colored inserts shall be provided with wiring blocks. Insert labels shall contain vertical lines spaced based on circuit size (3-, 4-, or 5-pair) and shall not interfere with running, tracing, or removing jumper wire/patch cords.
5. Mechanical specifications: Hardware shall accommodate more than 500 repeated insertions without incurring permanent deformation
6. Capacities: Wiring blocks shall be available in following pair quantity capacities:
 - a. 25 pair: Available without legs only
 - b. 50 pair: Available without legs only
 - c. 100 pair: Available with or without legs
 - d. 300 pair: Available with or without legs
7. Accessories shall be provided where specified or indicated.

2.4. Labels and Holders

A. General:

1. Labels and holders shall consist of clear label holder and colored label inserts, available in green, purple, yellow, blue, gray, brown, white, and orange as approved by Owner's Representative.
2. Insert labels shall contain vertical lines spaced on basis of circuit size (i.e. 3-, 4-, or 5-pair).
3. Transparent label holder shall snap onto wiring block to clearly identify wiring functions, provide circuit

B. Patch panels: Comply with following specifications for 110 patch panels:

1. Construction: Patch panel system shall include 110-style wiring blocks with following components:
 - a. SYSTIMAX Solutions 110D wiring blocks (100 pair)
 - b. SYSTIMAX Solutions 110B1 jumper troughs mounted on metal back panel, designed to provide routing of incoming cables behind 110 blocks and troughs
 - c. SYSTIMAX Solutions 110C connector blocks in 3-, 4-, or 5-pair modularity

- d. Designation strips
- e. White labels
- f. Grounding hardware
 - Approved product:
 - SYSTIMAX Solutions 110 patch panels

3. **Mounting:**

3.1. **Patch panel shall be wall mounted or rack mounted.**

Comply with BAS application standards for related cabling.

A. **Accessories:** Provide accessories where specified or indicated as follows:

1. Patch panel system terminal blocks: Terminal block shall terminate connectorized or raw-ended cable pairs. Provide connecting blocks in 3-, 4-, or 5-pair sizes as along with transparent label holders and insertable circuit identification labels.

Approved product:

SYSTIMAX Solutions 110P patch panel system

B. **Connector system mounting brackets:** Provide bracket for mounting 110 connector system hardware on 483 millimeters (19 inches) wide frame rack or data cabinet. Provide on rear of brackets cable support rings to secure cable routed through openings in mounting bracket to wiring blocks. Route cross-connect wire or patch cords from wiring blocks through troughs to side of frame to facilitate wire management. Mounting brackets shall be mounted one on top of other to support pair quantity requirements. Comply with following specifications:

1. SYSTIMAX Solutions 110RD2-100-19 mounting brackets shall be used for mounting two 110DW1-25 or 110DW1-50 wiring blocks and two 110B3 troughs on EIA 310C 483 millimeters (19 inches) wide frame.
2. SYSTIMAX Solutions 110RD2-200-19 mounting bracket shall be used for mounting two 110DW2-100 wiring blocks and two 110B3 troughs on EIA 310C 483 millimeters (19 inches) wide frame.
3. SYSTIMAX Solutions 110RP2-600-19 mounting bracket with set of three 1-inch bars that attach to 19-inch frame shall be used to support two 110 pre-connectorized patch panels or patch panel and 188 backboard and connector bracket.

Approved product:

SYSTIMAX Solutions 110RD2 mounting brackets

C. **Patch panel system backboards:** Use metal panels equipped with distributing rings to provide vertical paths for running patch cords or jumpers between 110 patch panel system terminal blocks.

D. Backboards shall be constructed of metal and provide 2 closed, formed, plastic distribution rings. Backboard shall be used with 110A wiring blocks to arrange jumper wires running between columns of wiring blocks. The backboard shall be placed between fields, to provide horizontal trough for wires and space to change direction of jumpers. One backboard should be provided for each vertical column of 110A wiring blocks. Comply with following specifications:

1. SYSTIMAX Solutions 188B1 backboard shall be mounted flat to wall surface.

2. SYSTIMAX Solutions 188B2 backboard with mounting legs shall be used for routing cable behind backboard.
- E. **110 jumper troughs:** White, flame retardant, molded, plastic frame shall accommodate patch cords or cross-connect wire.
1. Troughs shall be placed between each 100-pair wiring block and at top of each column, where it shall serve as a horizontal trough for routing patch cords and cross-connect wire. Comply with following specifications:
 - a. SYSTIMAX Solutions 569389-1 trough with legs shall be used with 110A wiring block.
 - b. SYSTIMAX Solutions 569597-1 trough without legs shall be used with 110D wiring block or patch panel.
 - c. SYSTIMAX Solutions 569597-1 distribution ring shall provide for routing of cross-connect wire or patch cords alongside wiring blocks.
- F. **110 jack panel system:** System shall be used for termination and inter-connection of voice and/or data circuits in premises wiring systems/data circuits in premises wiring systems.
- G. Connecting hardware apparatus product shall consist of 8-pin modular jacks, mounted in a metallic holder, and wired to standard 110 wiring block.
- H. Jack panels shall include 110 IDC field and 8-pin modular jack through printed wiring board. Comply with following standards:
- TIA/EIA-568-C.1
 - TIA/EIA-568-C.2
 - ISO/IEC 11801
 - CENELEC EN-50173
 - UL, ULC, and ACMA

Approved product:

SYSTIMAX Solutions 110 jack panels

- I. 110 patch cords and adapter cords:
1. The product shall provide for administration and interconnection of data and voice circuits.
 2. Cords shall be manufactured with cordage product, consisting of 24 AWG tinned copper stranded conductors insulated with high-density polyethylene.
 3. Insulated conductors shall be tightly twisted into individual pairs and jacketed with flame retardant PVC.
 4. Comply with following physical specifications:
 - a. Plastic material: Polycarbonate blend
 - b. Flammability rating: UL-rated 94 V-0
 - c. Contact material: Phosphor bronze
 - d. Contact plating: Gold (Au)—0.051 to 0.128 micrometers (2 to 5 micro inches); nickel—1.91 micrometers (75 micro inches)
 - e. Plug insertion life: 200 minimum
 - f. Operating temperature: -10 to 60 degrees C (14 to 140 degrees F)
 - g. Classification: UL and ULC CM (cordage) Approved

4. EXECUTION

4.1. Installation

- A. Contractor shall comply applicable codes, standards and with all local codes and requirements. It is the responsibility of the contractor to identify and adhere to any unique codes or requirements governed by the region where the work is to be performed.
- B. Faceplate/wall plates and Surface mount Boxes shall be installed following industry standard practices.
- C. Contractor shall not exceed the maximum pulling tension or the minimum bending radius for twisted pair cables per manufacturer's specifications.
- D. Contractor shall test all horizontal links per the ANSI/TIA-568 Requirements.

END of SECTION

3.1.8 27 16 00 Communications Connecting Cords, Devices and Adapters

3.1.8.1 27 16 19 Communications Patch Cords, Station Cords, and Cross Connect Wire

3.1.8.1.1 27 16 19.02 Copper Patch Cords

1. GENERAL

1.1. Work Includes

Provide all labor, materials, and equipment for the complete installation of all Copper Patch cords into the approved patch panels called for in the Bid Documents.

1.2. Scope of Work

- A. This section includes the minimum requirements for Copper Patch Cords.
- B. All Patch/Equipment Cords shall be new.
- C. On new installations, Patch/Equipment Cords shall be made by the same manufacturer as the Horizontal Cable used in the new installation.
- D. Patch/Equipment Cords shall be available in multiple colors. Colors required are to be detailed in the Bid Documents.
- E. All Patch/Equipment Cords shall be factory manufactured and tested for compliance to the appropriate standards and performance.
- F. Patch/Equipment Cord length shall be determined by the end user.
- G. Patch/Equipment Cords shall be installed using proper cable management.
- H. Minimum bend radius shall not be exceeded.

1.3. Quality Assurance

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative.
- B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- C. Strictly adhere to all Building Industry Consulting Service International (BICSI) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- D. Material and work specified herein shall comply with the applicable requirements of the current adopted revision of the following:

ANSI/ICEA S-87-640, Standard for Optical Fiber Outside Plant Communications Cable
ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard
ANSI/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure
BICSI – Telecommunications Distribution Methods Manual

J-STD – 607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 NFPA 70 – National Electric Code
 Telcordia, GR-20-CORE, Generic Requirements for Optical Fiber and Optical Fiber Cable

1.4. Submittals

Provide product data for the following:

Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

1.5. Coordination

Coordinate layout and installation of Patch/Equipment Cords with other trades.

2. PRODUCTS

2.1. Category 6 /Class E Patch Cords

- A. The Modular Patch Cords shall meet or exceed TIA ANSI/TIA-568-C.2 Category 6 and ISO/EIC Category 6/Class E specifications and shall be fully backward compatible with Category 5e and 5 connectors.
- B. Refer to Appendix 2: CommScope Part Numbers
 - 1. Approved Manufacturer:
 (The following Catalog/Part numbers are shown as examples, contact your CommScope Representative to specify correct Catalog/Part numbers)
 - a. CommScope Portfolio Reduced Diameter Patch Cords

Color	Product #	Material ID
Blue	MINO6-BL	CO166S2-0ZFxxx
White	MINO6-WH	CO166S2-08Fxxx
Yellow	MINO6-YL	CO166S2-09Fxxx
Dark Gray	MINO6-DG	CO166S2-03Fxxx
Spring Green	MINO6-SG	CO166S2-04Fxxx

Color	Product #	Material ID
Orange	MINO6-OR	CO166S2-06xxx
Purple	MINO6-PR	CO166S2-0Lxxx
Red	MINO6-RD	CO166S2-07xxx
Black	MINO6-BK	CO166S2-01xxx
Light Blue	MINO6-LB	CO166S2-02xxx

b. CommScope SYSTIMAX Standard Patch Cords

Color	Product #	Material ID
Blue	GS8E-BL	CPC3312-0ZFyyy
White	GS8E-WH	CPC3312-08Fyyy
Yellow	GS8E-YL	CPC3312-09Fyyy
Dk. Gray	GS8E-DG	CPC3312-03Fyyy
Green	GS8E-GN	CPC3312-04Fyyy

Color	Product #	Material ID
Orange	GS8E-OR	CPC3312-06Fyyy
Lilac	GS8E-LL	CPC3312-0BFyyy
Red	GS8E-RD	CPC3312-07Fyyy
Black	GS8E-BK	CPC3312-01Fyyy
Lt. Blue	GS8E-LB	CPC3312-02Fyyy

c. CommScope Ceiling Connector Assembly (CCA) for UTP MPTL Links

Material ID	Product Number	Environmental Space
760235585	CCA-GS8E-LSZH-BLACK-N018	LSZH
760235586	CCA-GS8E-LSZH-WHITE-N018	LSZH
760235587	CCA-GS8E-PLENUM-BLACK-N018	Plenum
760235588	CCA-GS8E-PLENUM-WHITE-N018	Plenum
760234921	Ceiling Connector Assembly (CCA) without cordage	Plenum/LSZH

2.2. Category 6 Augmented (6A)/Class EA Patch Cords

- A. The Modular Patch Cords shall meet or exceed the channel specifications of Amendment 1 to ISO/IEC 11 801:2002 Class EA and ANSI/TIA-568-C.2 Category 6A up to 500 MHz when used as part of a UTP Channel.
- B. Refer to Appendix 2: CommScope Part Numbers
 - 1. Approved Manufacturer:

(The following Catalog/Part numbers are shown as examples, contact your CommScope Representative to specify correct Catalog/Part numbers)

a. CommScope Portfolio Reduced Diameter Patch Cords

Color	Product #	Material ID
Blue	MiNo6A-BL	CO199K2-0ZFyyy
White	MiNo6A-WH	CO199K2-08Fyyy
Yellow	MiNo6A-YL	CO199K2-09Fyyy
Dark Gray	MiNo6A-DG	CO199K2-03Fyyy
Spring Green	MiNo6A-SG	CO199K2-04Fyyy

Color	Product #	Material ID
Orange	N/A	N/A
Purple	MiNo6A-VL	CO199K2-0LFyyy
Red	MiNo6A-RD	CO199K2-07Fyyy
Black	MiNo6A-BK	CO199K2-01Fyyy
Light Blue	MiNo6A-LB	CO199K2-02Fyyy

b. CommScope SYSTIMAX Standard Patch Cords

Color	Product #	Material ID
Blue	360GS10E-BL	CPCSSX2-0ZFyyy
White	360GS10E-WH	CPCSSX2-08Fyyy
Yellow	360GS10E-YL	CPCSSX2-09Fyyy
Dk. Gray	360GS10E-DG	CPCSSX2-03Fyyy
Green	360GS10E-GN	CPCSSX2-04Fyyy
Slate	360GS10E-SL	CPCSSX2-0CFyyy
Color	Product #	Material ID
Orange	360GS10E-OR	CPCSSX2-06Fyyy
Lilac	360GS10E-LL	CPCSSX2-0BFyyy

Red	360GS10E-RD	CPCSSX2-07Fyyy
Black	360GS10E-BK	CPCSSX2-01Fyyy
Lt. Blue	360GS10E-LB	CPCSSX2-02Fyyy

c. CommScope Ceiling Connector Assembly (CCA) for UTP MPTL Links

Material ID	Product Number	Environmental Space
760235589	CCA-GS10E-LSZH-BLACK-N018	LSZH
760235590	CCA-GS10E-LSZH-WHITE-N018	LSZH
760235591	CCA-GS10E-PLENUM-BLACK-N018	Plenum
760235592	CCA-GS10E-PLENUM-WHITE-N018	Plenum
760234921	Ceiling Connector Assembly (CCA) without cordage	Plenum/LSZH

3. EXECUTION

3.1. Installation

A. Copper Jumpers/patch cables

1. Contractor shall comply applicable codes, standards and with all local codes and requirements. It is the responsibility of the contractor to identify and adhere to any unique codes or requirements governed by the region where the work is to be performed.
1. Cable shall be installed following industry standard practices.
2. Contractor shall not exceed the maximum pulling tension or the minimum bending radius for copper cables per manufacturer's specifications.
3. All installations shall comply with:
 - ANSI/TIA-568 Series Commercial Building Telecommunications Cabling Standard,
 - ANSI/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
 - ANSI/TIA – 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - BICSI – Telecommunications Distribution Methods Manual
 - J-STD – 607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - NFPA 70 – National Electric Code

END of SECTION

COMMSCOPE MASTERFORMAT

The intent of this document is to provide customers with assistance in completing the Construction Specifications Institute (CSI) MasterFormat™ template for a CommScope telecommunication cabling system. This document provides the minimum performance criteria for the components and sub-systems comprising a complete cabling system. When the complete telecommunication cabling system is installed by an authorized contractor in accordance with the manufacturer's instructions, the cabling system shall be warranted per the CommScope system performance and component warranties.

Product part numbers, general design considerations, and installation guidelines are provided in this document. This document provides pertinent information to allow the contractor to bid the labor, supervision, tooling, and miscellaneous mounting hardware and consumables to install a complete system. It is the responsibility of the contractor to propose any and all items required for a complete system if not identified in this specification. This document is for planning purposes only and is not intended to modify or supplement any specifications or warranties relating to CommScope products or services.

END of SECTION

3.2 CORNING

3.2.1 27 13 23.01 General Requirements

- A. All fiber optic cable, connectors, adapter panels, hardware, and fiber optic pre-terminated systems shall be of the same manufacturer to ensure network system compatibility, optimum performance, fit, function, appearance and warranty. The optical fiber infrastructure shall utilize Corning Cable Systems cabling and connectivity as specified here-in.

3.2.2 3 23.05 Optical Fiber

- A. General Specifications
1. All fiber shall be manufactured using the Outside Vapor Deposition (OVD) process to ensure bandwidth consistency.
- B. Design Specification: The fiber type utilized in the cabling infrastructure shall be a Corning product that is specific to the application. Specific requirements for use of OM3, OM4 or OS2 shall be defined in project scope.
- C. **Multimode Fiber** shall meet the specifications and standards listed in Table 1,
1. Manufacturer shall use minEMBc bandwidth measurement methods to ensure multimode fiber performance
 2. 50um multimode fibers shall be bend-insensitive.

Table 1: Fiber Geometry, Optical Performance and Standards Compliance

	OM1	OM2	OM3	OM4
Core Diameter	62.5 ± 2.5 μm	50.0 ± 2.5 μm	50.0 ± 2.5 μm	50.0 ± 2.5 μm
Core Non-Circularity	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Cladding Diameter	125.0 ± 2.0 μm	125.0 ± 1.0 μm	125.0 ± 1.0 μm	125.0 ± 1.0 μm
Cladding Non Circularity	≤ 1.0 %	≤ 1.0 %	≤ 1.0 %	≤ 1.0 %
Core-to-Cladding Concentricity	≤ 1.5 μm	≤ 1.5 μm	≤ 1.5 μm	≤ 1.5 μm
Coating Diameter	242 ± 5 μm	242 ± 5 μm	242 ± 5 μm	242 ± 5 μm
Point discontinuity (850 nm, 1300 nm)	≤ 0.2 dB	≤ 0.2 dB	≤ 0.2 dB	≤ 0.2 dB
Cabled Effective Modal Bandwidth ¹⁾ (MHz•km), 850 nm	≥ 220	≥ 950	≥ 2000	≥ 4700
OFL Bandwidth (MHz•km)				
850 nm	≥ 200	≥ 700	≥ 1500	≥ 3500
1300 nm	≥ 500	≥ 500	≥ 500	≥ 500
Numerical Aperture	0.275 ± 0.015	0.200 ± 0.015	0.200 ± 0.015	0.200 ± 0.015
Standards Compliance	IEC 60793-2-10 A1b TIA/EIA 492 AAAA-A ISO/IEC 11801 type OM1	IEC 60793-2-10 A1a.1 ITU-T G.651.1 TIA/EIA 492 AAAB-A ISO/IEC 11801 type OM2	IEC 60793-2-10 A1a.2 ITU-T G.651.1 TIA/EIA 492 AAAC-B ISO/IEC 11801 type OM3	IEC 60793-2-10 A1a.3 ITU-T G.651.1 TIA/EIA 492 AAAD ISO/IEC 11801 type OM4

- D. All cabling and connectivity products shall use bend insensitive 50 um fiber that meets the performance requirements listed in Table 2.

Table 2: Bend Optimized Bend Performance and Thermal Performance

Attribute	Spec	Mean	Std. Dev.	Max
Macrobending Loss (turns x diameter)				
100x75 mm, 850 nm	≤ 0.05 dB	0.02	0.007	0.03
100x75 mm, 1300 nm	≤ 0.15 dB	0.08	0.008	0.08
2x30 mm, 850 nm	≤ 0.1 dB	0.02	0.013	0.05
2x30 mm, 1300 nm	≤ 0.3 dB	0.09	0.025	0.14
2x15 mm, 850 nm	≤ 0.2 dB	0.08	0.015	0.11
2x15 mm, 1300 nm	≤ 0.5 dB	0.27	0.048	0.39
Temperature Dependence				
850 nm	≤ 0.10 dB/km	0.02	0.006	0.03
1300 nm	≤ 0.10 dB/km	0.01	0.007	0.02
Temperature Humidity Cycle				
850 nm	≤ 0.10 dB/km	0.02	0.011	0.03
1300 nm	≤ 0.10 dB/km	0.03	0.017	0.05
Dry Heat Soak				
850 nm	≤ 0.20 dB/km	0.02	0.010	0.03
1300 nm	≤ 0.20 dB/km	0.01	0.005	0.02
Water Immersion				
850 nm	≤ 0.20 dB/km	0.01	0.013	0.04
1300 nm	≤ 0.20 dB/km	0.01	0.016	0.04
Damp Heat				
850 nm	≤ 0.20 dB/km	0.02	0.014	0.03
1300 nm	≤ 0.20 dB/km	0.02	0.017	0.05

- E. **Single-mode** fiber shall meet the specifications listed in Table 3
- F. Single-mode fiber shall meet ITU G.652 (Table D), ITU G.657 (Table A1), IEC Specification 60793-2-50 Type B1.3

Table 3: Single-mode OS2 Fiber Geometry and Optical Performance

		OS2
Cladding Diameter (μm)		125.0 ± 0.7
Core-to-Cladding Concentricity (μm)		≤ 0.5
Cladding Non-Circularity (%)		≤ 0.7
Mode Field Diameter (μm)		
1310 nm		8.6 + 0.4
1550 nm		9.8 ± 0.5
Coating Diameter (μm)		242 ± 5
Fiber Curl radius of curvature (m)		> 4.0
Point discontinuity (dB)		
1310 nm		≤ 0.05
1550 nm		≤ 0.05
Macrobend Attenuation (dB)		
Mandrel OD	Turns	
20 mm	1	< 0.50 at 1550 nm
20 mm	1	< 1.5 at 1625 nm
30 mm	10	< 0.05 at 1550 nm
30 mm	10	< 0.30 at 1625 nm
60 mm	100	< 0.01 at 1625 nm
Cable Cutoff Wavelength (nm)		< 1260
Zero Dispersion Wavelength (nm)		1304 ≤ λ ₀ ≤ 1324
Zero Dispersion Slope (S ₀) (ps/(nm ² •km))		≤ 0.089
Total Dispersion (ps/(nm•km))		
1550 nm		≤ 18
1625 nm		≤ 22
Cabled Polarization Mode Dispersion (ps / √km)		
PMD Link Design Value		< 0.06
Max Individual Fiber		< 0.1

3.2.3 Buffered Optical Fiber Cables for Horizontal Distribution

A. General:

1. Cable shall meet the requirements of the National Electrical Code (NEC) Section 770:
 - a. Non-Plenum Applications: Applicable Flame Tests: ANSI/UL 1666. Cables shall be listed OFNR.
 - b. Finished cables shall be tested to the applicable performance requirements of the Insulated Cable Engineers Association, Inc. (ICEA) Standard for Fiber Optic Premises Distribution Cable (ICEA S-83-596).
2. Cable shall be all-dielectric.

B. Fiber Specifications:

1. Detailed information on the cabled performance of the fiber types available for this cable design shall be found in the following manufacturers specifications:

- a. Dispersion Un-shifted Single-mode Fiber: Corning Generic Specification F3, "Generic Specification for Single-mode Optical Fiber in Tight Buffer Cables."
- b. 50/125 μ m and 62.5/125 μ m Multimode Fiber: Corning Generic Specification F4, "Generic Specification for Multimode Optical Fiber in Tight Buffer Cables."

C. Cable Construction:

1. All fibers, except white, shall be colored with ultraviolet (UV) curable inks. Fibers occupying the white position shall be left uncolored.
2. All fibers shall be coated with a low friction slip layer.
3. Coated fibers shall be buffered with a thermoplastic compound to a diameter of 900 μ m; 50 SYMBOL 109 "Symbol" 10m.
4. Individual fiber's 900 μ m buffer coating shall be color coded for identification. Color coding shall be in accordance with EIA/TIA-598, "Optical Fiber Cable Color Coding." Coloring material shall not be susceptible to migration and shall not affect the transmission characteristics of the optical fibers. Color-coded buffered fibers shall not adhere to one another. Buffered mechanical fibers in filler subunits, where used, shall be white (natural).
5. When buffered fibers are grouped into individual subunits, each subunit jacket shall be numbered for identification, with the exception of filler subunits where used. Numbers shall be repeated at regular intervals.
6. Fiber coating and buffer shall be removable with commercially available stripping tools in a single pass for connectorization or splicing.

D. Cable Core Construction: Strength members shall consist of high modulus strength yarns. Strength yarns shall be helically stranded around the buffered fibers. Non-toxic, non-irritant talc shall be applied to the yarns to allow them to be easily separated from the fibers and the jacket.

1. Non-unitized Cables, 2 to 24 Fibers: Fiber shall be stranded around a dielectric strength element and surrounded by layered strength yarns. Strength element shall be overcoated with a thermoplastic, when required, to achieve dimensional sizing to accommodate and support the 900 μ m buffered fibers. Cables having 12 to 24 fibers shall be dual layered. Strength yarns shall serve as the tensile strength members of the cable. A ripcord may be applied between the strength yarns and the outer jacket to facilitate jacket removal. An outer jacket shall be extruded over the strength yarns for physical and environmental protection.
2. Unitized Cables, 24 to 72 Fibers: Buffered fibers shall be grouped in six fiber subunits. In each subunit, individual fibers shall be stranded around a dielectric strength element and surrounded by layered strength yarns. A ripcord shall be incorporated in the subunit design to facilitate access to the individual fibers. Subunit jacket shall be extruded over the strength yarns for additional physical and environmental protection. Subunits shall be stranded around a dielectric central member. A ripcord shall be inserted beneath the outer jacket to facilitate jacket removal. An outer jacket shall be extruded around the subunits.
3. Unitized Cables, 72 to 144 Fibers: Buffered fibers shall be grouped in twelve fiber subunits. In each subunit, the individual fibers shall be stranded around a dielectric strength element and surrounded by layered strength yarns. A ripcord shall be incorporated in the subunit design to facilitate access to the individual fibers. Subunit jacket shall be extruded over the strength yarns for additional physical and environmental protection. Subunits may be stranded around a dielectric central member. Cables may contain filler subunits to provide symmetry to the cable

design. A ripcord shall be inserted beneath the outer jacket to facilitate jacket removal. An outer jacket shall be extruded around the subunits.

E. Cable Jacket:

1. Jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. Jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. Jacket shall be smooth, as is consistent with the best commercial practice. Jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.
2. Nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, and environmental test requirements of this document over the life of the cable.
3. Cable jacket and subunit jacket color shall be orange for cables/subunits containing multimode fiber except for cables/subunits containing 50/125 μ m Laser Optimized Fiber, which shall have an aqua colored jacket. Cable/subunit jacket color shall be yellow for cables containing single-mode fiber.
4. Outer cable jacket shall be marked with the manufacturer's name or ETL file number, date of manufacture, fiber count, fiber type, flame rating, listing symbol, and sequential length markings every two feet (e.g., "CORNING OPTICAL CABLE - MM/YY - 12 SME - EOS - OFNR FT4 c(ETL)us 00001 FEET"). Marking shall be in contrasting color to the cable jacket.

F. Cable Performance:

1. Temperature Range:
 - a. Storage temperature range for cable on the original shipping reel shall be -40 degrees C to +70 degrees C.
 - b. Installation temperature range for riser cables shall be -10 degrees C to +60 degrees C.
 - c. Operational temperature range for riser cables shall be -20 degrees C to +70 degrees C. Testing shall be in accordance with FOTP-3.
2. Crush Resistance:
 - a. When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," cable shall withstand a minimum compressive load of 100 N/cm (57 lbf/in) applied uniformly over the length of the compression plate.
 - b. While under compressive load, the fiber shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode).
3. Cyclic Flexing:
 - a. When tested in accordance with FOTP 104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles at a rate of 30 \pm 1 cycle per minute.
 - b. Fiber shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single mode) or greater than 0.60 dB at 1300 nm (multimode). J
 - c. Jacket shall not crack, split, or tear.
4. High and Low Temperature Bend:
 - a. When tested in accordance with FOTP-37, "Fiber Optic Cable Bend Test, Low and High Temperature," cable shall withstand four full turns around a mandrel at an installation

- temperature of -10 degrees C and +60 degrees C. Mandrel diameter shall be the greater of 20 times the cable OD or 150 mm.
- b. Fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single mode) or greater than 0.60 dB at 1300 nm (multimode).
5. Impact Resistance:
- a. When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," cable shall withstand a minimum of 2 impact cycles at 3 locations spaced a minimum distance of 150 mm. Impact energy shall be 2.94 Nm.
- b. Fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single mode) or greater than 0.60 dB at 1300 nm (multimode).
- c. Jacket shall not crack, split or tear.
6. Temperature Cycling:
- a. When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation after the second cycle at extreme operational temperatures (-20 degrees C and +70 degrees C) shall not exceed 0.40 dB/km at 1550 nm (single-mode) or 0.60 dB/km at 1300 nm (multimode). Change in attenuation is measured with respect to the baseline values measured at room temperature before temperature cycling.
7. Twist-Bend:
- a. When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 2 meters shall withstand 10 cycles of mechanical twisting and bending.
- b. Fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or 0.60 dB at 1300 nm (multimode).
8. Tensile and Fiber Strain:
- a. When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," and FOTP-38, "Measurement of Fiber Strain in Cables Under Tensile Load," a length of cable shall be tested to the rated tensile load.
- b. For cables < 12f the rated tensile load is 660 N (148 lbf) and for cables > 12f the rated tensile load is 1320 N (297 lbf).
- c. While under rated tensile load, fiber shall not experience a measured fiber strain greater than 60% of the fiber proof test level. After being held at the residual load (30% of the rated tensile load), the fiber shall not experience a measured fiber strain greater than 20% of the fiber proof test level nor an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode).
- d. After the tensile load is removed, fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode).

3.2.3.1 EXECUTION

1. EXAMINATION

- A. Do not begin installation until support structures and substrates have been properly prepared.
- B. Verify installation of the fiber optic cable backbone cabling Specified is **Section 27 13 23**.

- C. Verify installation of support structures for horizontal fiber optic cable before the installation.
- D. Do not install a fiber optic cable in a conduit or duct that already contains cabling, regardless of the cable type.
- E. Remove abandoned cables unless unused cables are reserved for future use or cable that is not terminated at equipment other than a connector and not identified for future use with a tag as required by the National Electrical Code.
- F. If support structures and substrate preparation are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

2. INSTALLATION

- A. General: Cable manufacturer shall provide installation procedures and technical support concerning the items contained in this specification.
- B. Testing and Acceptance:
 - 1. All cables shall be tested according to the requirements of ANSI/TIA 568.3-D. Any defects in the cabling, connectors, couplers or patch panels shall be repaired or replaced in order to ensure 100% useable fiber in all cables installed.
 - 2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter using an encircled flux (EF) compliant reference jumper per ANSI/TIA-526-14-C.
 - 3. If performing Tier II testing with an OTDR, fiber cabling shall be tested at both 850 nm and 1300 nm for Multimode or 1310 nm and 1550 nm for single-mode. This should be a bi-directional test that averages the values to compensate for any mode field mismatch.

3. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

4. SCHEDULES

- A. Tight-Buffered:
 - 1. MIC Tight Buffered, Plenum; Corning Generic Spec PGS049
 - 2. MIC Tight Buffered, Interlocking Armored, Plenum; Corning Generic Spec PGS049
 - 3. MIC Unitized Tight Buffered, Plenum; Corning Generic Spec PGS049
 - 4. MIC Unitized Tight Buffered, Interlocking Armored, Plenum; Corning Generic Spec PGS049
 - 5. Reel-In-A-Box, MIC Tight Buffered, Plenum; Corning Generic Spec PGS049
 - 6. MIC DX Tight Buffered Armored, Plenum; Corning Generic Spec PGS091
- B. Ribbon:
 - 1. Ribbon, Plenum; Corning Generic Spec PGS043
 - 2. Ribbon, Interlocking Armored, Plenum; Corning Generic Spec PGS043
 - 3. Ruggedized Ribbon, Plenum; Corning Generic Spec PGS043
 - 4. UltraRibbon Indoor, Gel-Free, Plenum; Corning Generic Spec PGS043
 - 5. LSZH Ribbon; Corning Generic Spec PGS056
 - 6. LSZH UltraRibbon Indoor Gel-Filled; Corning Generic Spec PGS056

7. LSZH UltraRibbon Indoor Gel-Free; Corning Generic Spec PGS056
8. Fan-out, Tight Buffered, Plenum; Corning Generic Spec PGS017

C. Loose Tube:

1. Mining and Petrochemical Tray-Rated, Loose Tube, Gel-Free; Corning Generic Spec PGS116

D. Hybrid:

1. Class 3 Limited Power Cables for Indoor Plenum; Corning Generic Spec PGS130
2. Class 3 Limited Power Cables for Interlocking Armored Cables for Indoor Plenum; Corning Generic Spec PGS130
3. Class 3 Limited Power Cables for Indoor/Outdoor, FREEDM Riser; Corning Generic Spec PGS130
4. Class 3 Limited Power Cables Tight-Buffered, Indoor, Plenum; Corning Generic Spec PGS130
5. Class 3 Limited Power Interlocking Armored Cables, FREEDM, Riser, Corning Generic Spec PGS130

3.2.4 27 13 23.10 Indoor Fiber Optic Cable

E. General Specifications

1. The cable shall meet all requirements stated in this specification.
2. Non-Plenum Applications Applicable Flame Tests: UL 1666. Cables shall be listed OFNR (OFCR).
3. Plenum Applications Applicable Flame Test: NFPA 262. Cables shall be listed OFNP (OFCP).
4. Finished cables shall conform to the applicable performance of the Insulated Cable Engineers Association, Inc. (ICEA) Standard for Fiber Optic Premises Distribution Cable (ICEA S-83-596).
5. Reference Division 27 13 23.25

F. Design Specifications: Indoor (riser or plenum) applications shall utilize Corning Cable Systems indoor tight-buffered cables and/or ribbon cables

1. MIC Riser and Plenum (all-dielectric and with interlocking armor)
2. MIC DX Riser and Plenum (all-dielectric armor)
3. Ribbon Riser and Plenum (all dielectric and with interlocking armor)

G. Tight-Buffered Cable (all-dielectric, with interlocking armor, and with all-dielectric armor)

1. Cable Construction

a. The coated fiber shall have a low friction slip layer placed between the acrylate coating of the optical fiber and the thermoplastic buffer. The diameter of the thermoplastic buffer coating shall be $900 \pm 50 \mu\text{m}$.

b. Cables with 2 to 24 Fibers

1. Layered strength yarns shall serve as the tensile strength member of the cable.
2. A ripcord may be applied between the strength yarns and the outer jacket to facilitate jacket removal.
3. The outer jacket shall be extruded over the strength yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.

c. Cables with 24-144 Fibers: Unitized Riser and Plenum Constructions

1. For fiber counts of 24-54, the buffered fibers shall be grouped in 6-fiber subunits; the fibers shall be stranded around a dielectric strength yarn in the subunit.
2. For fiber counts of 60-144, the buffered fibers shall be grouped in 12-fiber subunits; the fibers shall be stranded around a dielectric strength yarn in the subunit and shall be arranged in two layers.
3. Layered strength yarns shall serve as the tensile strength member of the subunit.
4. A ripcord may be applied between the strength yarns and the subunit jacket to facilitate jacket removal.
5. The subunit jacket shall be extruded over the strength yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.
6. The subunits shall be stranded around a dielectric central member. Cables may contain filler subunits to provide symmetry to the cable design. A ripcord shall be inserted beneath the outer jacket to facilitate jacket removal. The outer jacket shall be extruded around the subunits.

d. Outer Cable Jacket:

1. The cable jacket color shall be aqua for cables containing OM3 or OM4 fiber, and yellow for cables containing single mode fiber. For cables with sub-units, the sub-unit jacket color shall follow the same color guidance.
2. The indoor tight-buffered distribution cable shall also be available with aluminum interlocking armor. An additional outer jacket shall be placed over the interlocking armor. The color of the armor jacket shall match the jacket color of the optical fiber cable located inside of the armor. Cables with interlocking armor shall be available in fiber counts up to 144 fibers.
3. The indoor tight-buffered distribution cable shall also be available with a polyvinyl chloride (PVC) all dielectric armor. The armor material shall be dielectric (no metal/non-conductive). The cable shall not require bonding or grounding during installation or splicing. An additional outer jacket shall be placed over the dielectric armor. The color of the armor jacket shall match the jacket color of the optical fiber cable located inside of the armor. Cables with all-dielectric armor shall be available in fiber counts of 6, 12 and 24 fibers.

2. Identification

- a. The individual fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, "Optical Fiber Cable Color Coding."
- b. When buffered fibers are grouped into individual subunits, each subunit jacket shall be numbered for identification, with the exception of filler subunits where used.
- c. The outer jacket shall be marked with the manufacturer's name or ETL file number, date of manufacture, shop order number, optional SOC code (SR#####), fiber count, fiber type, flame rating, listing symbol, and sequential length markings every two feet.

H. Single Tube Ribbon Cable (all-dielectric, and with interlocking armor)

1. Ribbon Construction

- a. All ribbons in the cable shall be usable and meet required specifications
- b. Individual fiber ribbons shall contain 12 usable fibers.
- c. The fiber ribbon dimensions shall be measured in accordance with FOTP-123, "Measurement of Optical Fiber Ribbon Dimensions."
- d. All fibers in the ribbon shall be parallel with no cross over along the entire length of the cable.
- e. The fibers shall be colored with ultraviolet (UV) curable inks.
- f. Each fiber within a 12-fiber ribbon shall be distinguishable by means of color coding in accordance with TIA/EIA-598, "Optical Fiber Cable Color Coding." The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers.
- g. The ribbon matrix material shall be removable with industry standard peel-able methods or commercially available heat strippers.

2. Cable Construction

- a. Optical fibers shall be placed inside a central buffer tube.
- b. The central tube shall contain up to eighteen ribbons for fiber counts from 12 to 216 fibers.
- c. The fiber ribbons shall not adhere to the inside of the buffer tube.
- d. The central tube shall be resistant to external forces.
- e. The central tube shall be dry and not filled with gel.
- f. Dielectric strength elements shall be helically applied over the cable core covered with a second layer of dielectric strength elements helically applied in the opposite direction to provide longitudinal tensile strength and anti-buckling.
- g. Cables shall contain two ripcords beneath the outer jacket for easy sheath removal.
- h. Cable Outer Jacket

1. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.
2. The cable jacket color shall be aqua for cables containing OM3 or OM4 fiber, and yellow for cables containing single mode fiber.
3. The indoor plenum ribbon distribution cable shall also be available with aluminum interlocking armor. The interlocking armor for the plenum cables shall have a PVC jacket. The color of the armor jacket shall match the jacket color of the optical fiber cable located inside of the armor. Cables with interlocking armor shall be available in fiber counts from 12 to 216 fibers.

3. Identification

- a. The individual fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, "Optical Fiber Cable Color Coding."
- b. The outer jacket shall be marked with the manufacturer's name or ETL file number, date of manufacture, fiber count, fiber type, flame rating, listing symbol, telecommunication handset symbol, and sequential length markings every two feet.

3.2.5 27 13 23.15 Indoor/Outdoor Cable

A. General Specifications

1. The cable shall meet all requirements stated in this specification.
2. Non-Plenum Applications - Applicable Flame Tests: UL 1666. Cables shall be listed OFNR (OFCR).
3. Plenum Applications - Applicable Flame Test: NFPA 262. Cables shall be listed OFNP (OFCP).
4. Finished cables shall conform to the applicable performance of the Insulated Cable Engineers Association, Inc. (ICEA) Standard for Standard For Indoor-Outdoor Optical Cable (ICEA S-104-696).

B. Loose Tube Indoor/Outdoor Fiber Optic Cable (all-dielectric riser 2-288F, all-dielectric plenum 2-72F, and riser with interlocking armor 2-288F)

1. Cable Construction

- a. Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 2.5 mm.
- b. Each buffer tube shall contain up to 12 fibers
- c. The fibers shall not adhere to the inside of the buffer tube or to each other.
- d. Each buffer tube shall contain a water blocking element for water-blocking protection. The water swellable element shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter. This element will preclude the need for other water-blocking material; the buffer tubes shall be gel-free.
- e. The optical fibers shall not require cleaning before placement into a splice tray or fan-out kit.
- f. The buffer tubes shall be resistant to kinking.
- g. Filler rods may be included in the cable core to lend symmetry to the cable cross-section where needed. Fillers shall be placed so that they do not interrupt the consecutive positioning of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 2.5 mm in outer diameter.
- h. The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod. The purpose of the central member is to provide tensile strength and prevent buckling of the cable. The GRP rod shall be overcoated with a thermoplastic, when required to achieve dimensional sizing to accommodate buffer tubes/fillers.
- i. Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process. Water blocking yarn(s) shall be applied longitudinally along the central member during stranding.
- j. Two polyester yarn binders shall be applied contrahelically with sufficient tension to secure each buffer tube layer to the dielectric central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking and dielectric with low shrinkage.
- k. For single layer cables, a water blocking tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The tape shall be held in place by a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter.

- l. For dual layer cables, a second (outer) layer of buffer tubes shall be stranded over the original core to form a two-layer core. A water blocking tape shall be applied longitudinally over both the inner and outer layers with each being held in place with a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter.
- m. The cable shall contain at least one ripcord under the sheath for easy sheath removal.
- n. A flame-retardant tape may be applied to provide additional resistance to flame propagation for higher fiber count cables.
- o. Outer Cable Jacket
 - 1. Cables shall be sheathed with flame-retardant polyvinyl chloride (PVC). Jacketing material shall be applied directly over the tensile strength members and water blocking tape. The PVC shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.
 - 2. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.
 - 3. The riser rated cables shall be available with an optional aluminum interlocking armor. The interlocking armor shall be covered with a flame-retardant PVC outer jacket. Cables with interlocking armor shall be available in fiber counts up to 288 fibers.

2. Identification

- a. Each fiber shall be distinguishable by means of color-coding accordance with TIA/EIA-598, "Optical Fiber Cable Color Code." The fibers shall be colored with ultraviolet (UV) curable inks.
- b. Buffer tubes containing fibers shall be color coded with distinct and recognizable colors in accordance with TIA/EIA-598, "Optical Fiber Cable Color Coding."
- c. Buffer tube colored stripes shall be inlaid in the tube by means of co-extrusion when required. The nominal stripe width shall be 1 mm.
- d. For dual layer buffer tube construction cables, standard colors are used for tubes 1 through 12 and standard colors with stripes are used to denote tubes 13 through 24. The color sequence applies to tubes containing fibers only and shall begin with the first tube. The tube color sequence shall start from the inside layer and progress outward.
- e. Cable jackets shall be marked with the manufacturer's name or file number, month and year of manufacture, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code® (NESC®), fiber count, and fiber type, flame rating and listing marking. The height of the marking shall be approximately 2.5 mm.

C. Tight Buffered Indoor/Outdoor Cable (all-dielectric and with interlocking armor)

1. Cable Construction

- a. The coated fiber shall have a low friction slip layer placed between the acrylate coating of the optical fiber and the thermoplastic buffer. The diameter of the thermoplastic buffer coating shall be $900 \pm 50 \mu\text{m}$.
- b. Cables with 2 to 24 Fibers:
 1. The fibers shall be stranded around a dielectric strength element consisting of all dielectric strength element consisting of aramid strength yarns.
 2. Water-blocking, strength yarns shall serve as the tensile strength members of the cable. The strength members shall be a high modulus aramid yarn and shall be water swellable to prevent the migration of water throughout the cable. The water-blocking aramid yarns shall be non-nutritive to fungus, electrically non-conductive and homogeneous.
- c. Cable Outer Jacket
 1. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; pressure extruded jackets are not acceptable. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service. The jacket shall not promote the growth of fungus.
 2. The jacket color for of all fiber types shall be black.
 3. The OFNP cable jacket shall be a flame retardant Polyvinyl Chloride (PVC) containing carbon black, resistant to prolonged ultraviolet light exposure. For cables with 2 to 12 fibers the nominal thickness of the cable jacket shall be 0.8 mm, and for the 18 or 24-fiber cable the nominal thickness of the cable jacket shall be 1.0 mm.
 4. The OFNR cable jacket shall be a flame retardant Polyvinyl Chloride (PVC) containing carbon black, resistant to prolonged ultraviolet light exposure. For cables with 2 to 12 fibers the nominal thickness of the cable jacket shall be 0.9 mm, and for the 18 or 24-fiber cable the nominal thickness of the cable jacket shall be 1.0 mm.
 5. The cables shall be available with an optional aluminum interlocking armor. The interlocking armor shall be covered with a flame-retardant PVC outer jacket for OFNP and OFNR cables.
- d. Identification
 1. The individual $900 \mu\text{m}$ buffered fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, "Optical Fiber Cable Color Coding."
 2. The outer jacket shall be marked with the manufacturer's name or ETL file number, date of manufacture, shop order number, optional SOC code (SR#####), fiber count, fiber type, flame rating, listing symbol, and sequential length markings every two feet.

3.2.6 27 13 23.20 Outdoor Fiber Optic Cable

A. General Specifications

1. The cable shall meet all requirements stated in this specification.
 2. The cable shall be an accepted product of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 (PE-90) and meet the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-2006 and GR-20-CORE.
- B. Design Specifications: For outside plant installations, or those meeting the NEC requirements, Corning Cable Systems Outdoor cable shall be used:
1. ALTOS (all-dielectric)
 2. ALTOS Lite (armored)
- C. Outside Plant Cable
1. Cable Construction
 - a. Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 2.5 mm. The buffer tube shall be polypropylene.
 - b. Each buffer tube shall contain up to 12 fibers
 - c. The fibers shall not adhere to the inside of the buffer tube.
 - d. The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrink back requirements of 7 CFR 1755.900.
 - e. Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. Fillers shall be placed so that they do not interrupt the consecutive positioning of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 2.5 mm in outer diameter.
 - f. The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod (optional steel central member). The purpose of the central member is to provide tensile strength and prevent buckling of the cable. The GRP rod shall be overcoated with a thermoplastic, when required to achieve dimensional sizing to accommodate buffer tubes/fillers.
 - g. Each buffer tube shall contain water blocking material embedded in the inside wall of the buffer tube for water-blocking protection. The water blocking material shall be non-nutritive to fungus, electrically non-conductive, and homogeneous. It shall also be free from dirt or foreign matter. This element will preclude the need for other water-blocking material such as gels, yarns, foams, or tapes; the buffer tubes shall be gel-free.
 - h. The optical fibers shall not require cleaning before placement into a splice tray or fan-out kit.
 - i. Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process.
 - j. Water swellable yarn(s) shall be applied longitudinally along the central member during stranding. Water blocking elements shall be applied uniformly throughout the buffer tube.
 - k. Two polyester yarn binders shall be applied contrahelically with sufficient tension to secure each buffer tube layer to the dielectric central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking, and dielectric with low shrinkage.
 - l. For single layer cables, a water swellable tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter.

- m. For dual layer cables, a second (outer) layer of buffer tubes shall be stranded over the original core to form a two-layer core. A water swellable tape shall be applied longitudinally over both the inner and outer layer. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter.
 - n. Non-armored cables shall contain one ripcord under the sheath for easy sheath removal. Armored cables shall contain two ripcords under the steel armor for easy armor removal.
 - o. All tensile strength shall be provided by the central member.
 - p. Non-armored cables shall be sheathed with medium density polyethylene (MDPE). The minimum nominal jacket thickness shall be 1.3 mm. Jacketing material shall be applied directly over cable core and water swellable tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.
 - q. Armored cables without an inner jacket shall have an armor layer applied directly over the cable core and water swellable tape. The armor shall be a corrugated steel tape, plastic-coated on both sides for corrosion resistance, and shall be applied around cable core and water swellable tape with an overlapping seam with the corrugations in register. The outer jacket shall be applied over the corrugated steel tape armor. The outer jacket shall be a MDPE with a minimum nominal jacket thickness of 1.3 mm. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.
 - r. The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8.
 - s. The jacket or sheath shall be free of holes, splits, and blisters.
2. Identification
- a. Each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding." The fibers shall be colored with ultraviolet (UV) curable inks.
 - b. Buffer tubes containing fibers shall be color coded with distinct and recognizable colors in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding."
 - c. Buffer tube colored stripes shall be inlaid in the tube by means of co-extrusion when required. The nominal stripe width shall be 1 mm.
 - d. For cables containing more than 12 buffer tubes, standard colors are used for tubes 1 through 12 and stripes are used to denote tubes 13 through 24. The color sequence applies to tubes containing fibers only and shall begin with the first tube. If fillers are required, they shall be placed in the inner layer of the cable. The tube color sequence shall start from the inside layer and progress outward.
 - e. Cable jackets shall be marked with the manufacturer's name, month and year of manufacture, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code® (NESC®), fiber count, and fiber type.

END OF SECTION

[COMMSCOPE: 27 15 43.15 Communications Fiber Connectors, Adapters and Adapter Panels]

3.2.7 27 11 16.00.00 Fiber Optic Housing Specifications

Fiber optic housings specified in this document include one through four unit-height housings ("1U", "2U", "3U" and "4U"), whereby one industry standard (EIA compliant) rack unit is defined as 44.45 mm in height in compliance with EIA-310-D ("Cabinets, Racks, Panels, and Associated Equipment"). The environment for this hardware is typically an indoor, environmentally controlled building.

The various capacities of the housings specified in this document are listed below:

Unit Size	Panel* Capacity	Fiber Optic Housing Port Capacity:					
		6F / Panel	8F / Panel	12F / Panel	16F / Panel	24F / Panel	72F / Panel
*Includes panels, modules &/or cassettes.		ST/SC/LC	ST/SC/LC	ST/SC/LC	LC only	LC only	MTP only
1U	2	12	16	24	32	48	144
2U	4	24	32	48	64	96	288
3U	6	36	48	72	96	144	432
4U	12	72	96	144	192	288	864

3.2.7.1 Rack-mountable Connector Housing Capacities

A. 1U Patch Panel; Function & Capacity

1U rack-mountable housing (also known as a patch panel) is defined as 1.75 inches (44.45 mm) in height, whereby one EIA rack space or panel height (denoted as 1U) is defined as being 44.45 mm.

4. The 1U housing shall provide a base enclosure with removable top covers, front and rear doors, and a slide-out drawer or tray.
 - a. The housing shall provide necessary protection from incidental contact, dust and debris that commonly occurs in a premise or enterprise communications network environment or data center.
 - b. The housing shall be fully accessible from the top, rear and front sides.

- c. The housing shall provide all necessary provisions for proper management and administration of optical fiber, fiber optic connectors, splices, cable-subunits, transition kits and other related components.
5. The 1U rack-mountable connector housing shall support cross-connection, inter-connection and/or splicing applications and routing schemes in the same housing.
 1. The housing shall accommodate direct connectorization via connector panels (as specified in Section 7.0) or in conjunction with slack storage cassettes (as specified in Section 6.0) that hold the connector panels.
 1. Connector panels and modules shall be held in place via interchangeable panel retention clips that snap into position independent of one another onto panel clip retention blocks or components that attach to a slide-out tray or into the tray itself.
 2. The housing shall be capable of holding up to two (2) connector panels, modules or cassettes in a horizontal orientation on a slide-out tray.
 2. The housing shall accommodate pigtail splicing via interchangeable splice cassettes (as specified in Section 5.0) with pigtailed connector panels, while maintaining the capability to accommodate pigtailed connector modules (as specified in Section 8.0) and/or pigtailed connector panels outside of the splice cassettes.
 1. The splice cassettes shall load into the housing between stackable rails that retain the cassette on both sides of the cassette; the center stackable rail shall interface and engage behind the center panel clip retention block [1.2.1.a] and directly onto the slide-out tray or another center stackable rail.
 2. The housing shall be capable of holding up to two (2) splice or slack storage cassettes in a horizontal orientation on a slide-out tray.

B. 1U Jumper Management

The housing's slide-out tray shall provide jumper routing guides in the front to protect and manage jumpers and/or patch-cords that exit and enter through the sides of the front of the housing.

1. The slide-out tray shall incorporate and allow interchangeable attachment of three (3) jumper routing guides.
 - a. The front jumper routing guides shall attach to stackable panel clip retention components as specified in Section 1.2 of this document by sliding down and locking into place upon a retention tab via the routing guide's integral retention slot, thereby making the routing guides connected to the sliding tray.
 - b. The routing guides shall not interfere with access to adapters from above or below the sliding shelf.
 - c. The routing guide shall incorporate a tab on the front surface and an indentation (or finger slot) on the top surface (for use when the housing's top cover is removed) for grasping to manually assist with pulling out the sliding tray; the finger slot shall also be capable of holding connector ferrule protective caps.
 - d. The routing guides shall provide pass-through for a bundle of jumpers that comprises a cross-sectional area up to at least one square inch (725 mm²).

- e. The routing guides shall incorporate a flexible flapper that allows loading and removal of jumpers from the routing guide while still providing retention capabilities of the jumpers.
- f. The routing guides' top and bottom interior surfaces shall be curved or rounded to conform to the bend radii of fiber optic jumper or patch-cords that pass through the guides.
- g. The center routing guide shall be labeled with the letters "A" and "B" for specifying and differentiating panel positions within the housing.
- h. The routing guides shall be constructed from injection-molded plastic and be a color that matches the housing and slide-out tray.
- i. The housing shall be capable of supporting connections to 48 fiber optic jumpers or patch-cords with an outside diameter range of 1.6 mm to 3.0 mm.

C. 1U Front Access

The front of the housing and interior slide-out tray shall be accessible via a tinted translucent door. The door shall be removable from metal hinges by removing a single screw on each side of the door.

1. The door shall contain two slam latches (located on the left and right side of the door) that can individually be de-latched with single-hand operation.
2. The door shall contain provisions for installation of a keyed lock assembly.
3. The door shall allow customization of the applique through in-mold labeling.
4. The door shall contain an area on its inside surface that is hidden from view by the door's applique and is capable of holding adhesive-backed label strips.
5. The door shall contain a crop mark in the upper left portion on the front surface for placement of an adhesive-backed label or label strip.
6. The front of the housing shall contain jumper egress openings on both sides that are aligned with the jumper routing guides specified in Section 1.3 of this document and will provide access for optical fiber jumpers and patch-cords as they enter or exit the front sides of the housing.

D. 1U Rear Access

1. The rear of the housing and interior slide-out tray shall be accessible via a metal door.
 - a. The rear door shall be removable from metal hinges by removing a single screw on each side of the door.
 - b. The rear door shall contain a turn-latch in the center of the door for opening and closing the door.
 - c. The rear door shall allow installation of a keyed latch assembly in the center, which can also serve as the primary means for opening and closing the door.
 - d. The rear door shall incorporate pairs of lances that run the length of the door providing a means to strain-relieve incoming fiber optic cables to the inside surface of the door.
 - e. The rear door shall incorporate pre-stamped punch-out openings that will allow fiber optic cable to enter the housing perpendicular to the rear of the housing.

2. The rear of the housing shall contain openings on both sides of it that allow fiber optic cables and/or cable sub-units to enter the housing.

E. 1U Top Access

1. The top of the housing shall be accessible via two sliding top covers that converge and interface in the center of the housing via two alternating support tabs.
2. The top covers shall be made from tinted translucent injection-molded plastic.
3. The top covers shall incorporate pockets or slots for containing two label cards (4 inches by 4 inches).
4. The top covers shall contain raised detents that interface with rails on the housing.
5. The top covers shall be able to be locked-down or fixed in place through installation of screws on the side of the housing.

F. 1U Cable Strain-relief

1. The housing shall provide means for strain-relieving fiber optic cables both interior to and exterior to the rear of the housing.
 - a. External strain-relief shall be achieved through attachment of an external strain-relief bracket that attaches onto either side of the housing via two fasteners.
 1. The external strain-relief bracket shall be of a two-piece design that allows disassembly and reassembly such that it can be used in a universal fashion on either side of the housing and with either top or bottom cable entry into the housing.
 2. The external strain-relief bracket shall provide slots or holes for securing cables with hook-and-loop type straps.
 3. The external strain-relief bracket shall provide threaded holes for attaching up to two cable clamps, as specified in Section 9.0, and accommodate a range of cable sizes.
 4. Internal strain-relief shall be achieved through one of three means: 1) attachment of a removable and interchangeable internal strain-relief bracket that mounts on the floor of the rear assembly housing via retention studs and a spring-loaded plunger, 2) strain-relieving directly to the inside surface of the door per Section [1.7.4], or
 5. 3) strain-relieving via means specified in Section [1.13] for when cable(s) enter directly through and perpendicular to the rear door.
 6. The internal strain-relief bracket shall strain-relieve a single cable up to 34.0 mm or multiple cables of a comparable bundle diameter.
 7. The internal strain-relief bracket shall incorporate pairs of lances for hook-and-loop type straps or tape.
 8. The internal strain-relief bracket shall contain threaded holes for installation of central member and cable strength yarn strain-relief hardware.
 9. The internal strain-relief bracket shall be installable on either side of the rear of the housing and of a singular design for either side.
 10. The internal strain-relief bracket shall be removable, and its support plate shall not interfere with removal or sliding action of the interior tray.

G. 1U Interior Management

The 1U housing's interior tray shall contain provisions for routing and maintaining fiber optic cable components, including cable sub-units and buffer tubes, 900 μm optical fiber, and buffer tube transition kits.

1. The sliding tray of the housing shall provide holes or slots for the installation (and removal) of fiber retention or slack management clips.
 - a. The fiber retention clip shall be made from flexible, durable injection-molded plastic.
 - b. The fiber retention clip shall incorporate flexible fingers on the top that allow the quick removal and installation of optical fiber and cable sub-units.
 - c. The fiber retention clip shall be of a segmented design with a divider that separates the clips into two sections for greater organized fiber storage capacity.
 - d. The fiber retention clip shall be installable and configurable such that they form two groups (either complete or incomplete) in a circular pattern for customized routing of optic fiber.
 - e. The sliding tray of the housing shall provide holes or slots for the installation (and removal) of one transitional strain-relief clip.
 1. The transitional strain-relief clip shall be made from flexible durable injection-molded plastic.
 2. The transitional strain-relief clip shall be capable of holding six
 3. Six buffer tube transition or furcation kits that can each manage a single twelve-fiber buffer tube.; the clip shall hold the kits via direct insertion into the clip or additionally through securing with hook-and-loop type straps. Note: Fiber fan-out devices are used to build 250 μm fiber in buffer tubes out to 900
 4. μm for fiber protection and to allow connectorization.
 5. The transitional strain-relief clip shall be stackable utilizing only the integral retention features to affix the clips to one another.
 6. The transitional strain-relief clip shall allow individual access in both removal and installation of individual furcation kits independent of adjacent furcation kits that may or may not be already installed in the clip.
 - f. The sliding tray shall contain an embossed pattern that conveys the recommended routing path that optical fiber and cable sub-units follow in routing from cable entry to the adapter panels contained within the housing.
2. The 1U housing's interior tray shall incorporate holes or slots for installation of a center rail that enables installation of two splice cassettes per Section 1.2.2.
3. The 1U housing's interior tray shall contain strain-relief slots on both sides of the rear corners of the tray for securing cables via cable-ties or hook-and-loop type straps that enter directly through the rear door of the housing via pass-through ports specified in Section 1.7.5.
4. The 1U housing's interior tray shall be removable from either the front or rear of the housing.
 - a. The tray shall contain detents allowing the tray to lock into multiple positions as it slides out of the housing.
 - b. The housing shall contain windows on both sides to allow access to release tabs that enable complete removal of the tray from the rear of the housing.
 - c. The tray shall be able to be locked-down or fixed such that it can no longer slide through installation of screws into both the left and right side of the housing.

H. 1U Mounting Provisions

The housing shall be mountable in an EIA-310 compatible 465 mm or 592 mm rack.

1. The housing shall be able to be mounted with both a standard 5-in. (13 cm) frontal projection, and a 3-in. (8 cm) partial-flush projection with the included mounting brackets.
 - a. The mounting brackets shall incorporate open slots that allow pre- installation of the mounting screws prior to attachment of the mounting brackets to the rack or frame.
 - b. The mounting brackets shall attach to the side of the housing via screws or fasteners, and the sides of the housing shall include threaded mounting holes for both the standard 5-in. (13 cm) frontal projection and the 3-in. (8 cm) partial-flush projection.
 - c. The mounting brackets shall be symmetric and of the same design for either side of the housing.
2. The housing shall be able to be mounted with a flush-mount projection through both of the following options:
 - a. Through removal of the front door and front jumper routing guides and shifting of the sliding tray forward to a flush-mount position with the bracket installed in the 3-in. (8 cm) partial-flush position.
 - b. Through availability of accessory flush-mounting brackets that achieve a recessed mounting with the door of the housing flush with the front plane of the rack or frame while providing holes for jumper egress through the side of the housing.

I. 1U Dimensions

1. The housing shall not exceed a depth requirement of 16.5 inches (42.0 cm), excluding door latches and locks.
2. The housing shall not exceed a width requirement of 17.2 inches (43.5 cm), excluding mounting brackets, fasteners or entry grommets.

J. 1U Materials and Compliance

1. The unit shall meet the design requirements of ANSI/TIA/EIA-568 and the plastics flammability requirements of UL 94 V-0.
2. The connector housings shall have a labeling scheme that complies with ANSI/TIA/EIA- 606.
3. The housing shall contain the following labels that shall be affixed to the base of the front compartment of the housing.
 - a. A laser radiation warning label that contains the word "DANGER" in a highlighted color or colored background (preferably red).
 - b. A UL listing label that lists the product as a communication circuit accessory (listing 41S4 or equivalent).
 - c. A product information label that contains the manufacturer's name, product part number, manufacturing location, date of manufacture, as well as other pertinent information for manufacturing traceability.

4. The housing and/or packaging shall include a hardware accessory kit that includes the following components: 1) installation instructions, 2) fiber optics documentation & administration label, 3) 8" cable ties, 4) 4" cable ties, 5) #12-24 mounting screws.
5. Housings shall be manufactured using materials and colors per Table 1 for structural integrity and shall be finished with a wrinkled black powder coat for durability on exterior metal. Installation fasteners shall be included and shall be black in color.

Attribute	Top Cover	Front Door	Rear Door	Base Housing	Sliding Tray	Related Brackets
Material:	Plastic (1)	Plastic (1)	Metal (2)	Metal (2)	Plastic (3)	Metal (4)
Color:	Clear, Tinted	Clear, Tinted	Black, <u>Corvel</u>	Black, <u>Corvel</u>	Black	Black, <u>Corvel</u>
Finish:	Flat/ Smooth	Flat/ Smooth	Midnight Wrinkle	Midnight Wrinkle	Flat/ Smooth	Midnight Wrinkle
Material Notes:						
<i>(1) Plastic: Flame retardant, UV-stabilized polycarbonate (medium-viscosity)</i>						
<i>(2) Metal: Cold Rolled Steel, 18 Gauge</i>						
<i>(3) Plastic: Polyphenylene ether (PPE) resin - Polystyrene blend, mineral-filled</i>						
<i>(4) Metal: Cold Rolled Steel, 11 Gauge</i>						

Table 1: 1U Housing Materials

K. 2U Patch Panel; Function & Capacity

A 2U rack-mountable housing (also known as a patch panel) is defined as 3.50 inches (88.90 mm) in height per EIA, whereby one EIA rack space or panel height (denoted as 1U) is defined as being 44.45 mm. The 2U housing shall meet all of the requirements of the 1U housing with the following exceptions and/or additional requirements:

1. The housing shall be capable of holding up to four (4) connector panels and/or modules in a horizontal orientation on a slide-out tray.
2. The housing shall be capable of holding up to four (4) splice or slack storage cassettes in a horizontal orientation on a slide-out tray.

L. 2U Jumper Management

1. The slide-out tray shall incorporate and allow interchangeable attachment of six (6) jumper routing guides.
2. The center routing guide shall be labeled with the letters "A" and "B" for specifying and differentiating panel positions within the housing.

3. The center routing guide shall be labeled with the letters "C" and "D" for specifying and differentiating panel positions within the housing for the second layer of panels and/or cassettes.
4. The housing shall be capable of supporting connections to 96 fiber optic jumpers or patch-cords with an outside diameter ranging from 1.6 mm to 3.0 mm.

M. 2U Interior Management

1. The sliding tray of the housing shall provide holes or slots for the installation (and removal) of two (2) transitional strain-relief clips.
2. The 2U housing's interior tray shall incorporate holes or slots for installation of two stackable center rails that enable installation of four (4) splice or slack storage cassettes.

N. 3U Patch Panel; Function & Capacity

A 3U rack-mountable housing (also known as a patch panel) is defined as 5.25 inches (133.35 mm) in height per EIA, whereby one EIA rack space or panel height (denoted as 1U) is defined as being 44.45 mm. The 3U housing shall meet all of the requirements of the 1U housing with the following exceptions and/or additional requirements:

1. The 3U rack-mountable connector housing shall support cross-connection, inter-connection and/or splicing applications and routing schemes in the same housing.
2. The housing shall be capable of holding up to six (6) connector panels and/or modules in a horizontal orientation on a slide-out tray.
3. The housing shall be capable of holding up to six (6) splice or slack storage cassettes in a horizontal orientation on a slide-out tray.

O. 3U Jumper Management

1. The slide-out tray shall incorporate and allow interchangeable attachment of nine (9) jumper routing guides.
2. The center routing guide shall be labeled with the letters "A" and "B" for specifying and differentiating panel positions within the housing.
3. The center routing guide shall be labeled with the letters "C" and "D" for specifying and differentiating panel positions within the housing for the second layer of panels and/or cassettes.
4. The center routing guide shall be labeled with the letters "E" and "F" for specifying and differentiating panel positions within the housing for the third layer of panels and/or cassettes.
5. The housing shall be capable of supporting connections to 144 fiber optic jumpers or patch-cords with an outside diameter ranging from 1.6 mm to 3.0 mm.

P. 3U Interior Management

1. The sliding tray of the housing shall provide holes or slots for the installation (and removal) of three (3) transitional strain-relief clips.
2. The 3U housing's interior tray shall incorporate holes or slots for installation of two stackable center rails that enable installation of six (6) splice or slack storage cassettes.

Q. 4U Patch Panel; Function & Capacity

A 4U rack-mountable housing (also known as a patch panel) is defined as seven inches (178 mm) in height per EIA, whereby one EIA rack space or panel height (denoted as 1U) is defined as being 44.45 mm.

1. The 4U rack-mountable connector housing shall support cross-connection, inter-connection and/or splicing applications and routing schemes in the same housing.
2. The housing shall accommodate direct connectorization via connector panels (as specified in Section 7.0) or in conjunction with slack storage cassettes (as specified in Section 6.0) that hold the connector panels.
 - a. Connector panels and modules shall be held in place via interchangeable panel retention clips that snap into position independent of one another on both the top and bottom of the housing.
 - b. The housing shall be capable of holding up to twelve (12) connector panels and/or modules.
3. The housing shall accommodate pigtail splicing via interchangeable splice cassettes (as specified in Section 5.0) with pigtailed connector panels, while maintaining the capability to accommodate connector-pigtail modules (as specified in Section 8.0) and pigtailed connector panels outside of the splice cassettes.
 - a. The splice cassettes shall load into the housing on interchangeable and/or permanent independent tracks, rails or guides that retain the cassette on both the top and bottom surfaces of the housing.
 - b. The housing shall be capable of holding up to twelve (12) splice or slack storage cassettes.

R. 4U Jumper Management and Front Access

The main housing shall contain a front jumper assembly compartment whose function is to protect and manage jumpers and/or patch-cords that interface with the main housing behind it.

1. The front jumper assembly compartment shall be removable and attached via mounting screws and support tabs.
2. The front jumper assembly compartment shall be accessible via a tinted translucent door.
 - a. The door shall be removable from hinge pins by deflecting a plastic stop-tab that can be flexed, permitting the door to slide laterally off of the hinge pins.
 - b. The door shall contain two slam latches (located on the left and right side of the door) that can individually be de-latched with single hand operation.
 - c. The door shall contain provisions for installation of a keyed lock assembly.
 - d. The door shall contain provisions for holding two label cards (approximately 8" by 4").
 - e. The door shall allow customization of the applique though in-mold labeling.
3. The front jumper assembly shall contain jumper egress openings on both sides that are edged with rubber pass-through grommets that provide bend radius support for optical fiber jumpers and patch-cords.
4. The front jumper assembly shall contain four (4) jumper management routing clips on both the floor and ceiling of the compartment.
 - a. The clips shall be spaced equidistant relative to one another.

- b. The clips shall have flexible fingers permitting the installation and removal of jumpers and/or patch-cords from the front of the clips.
 - c. The clips shall each be capable of holding at least 144 (2.0 mm) jumpers or patch-cords.
5. The front jumper assembly shall contain two pass-through grommets on the top for jumper egress to other housings or equipment racks.

S. 4U Rear Access

1. The rear assembly housing shall be accessible via a metal door
 - a. The door shall contain a routing and cable sub-unit slack storage bracket for interior management of cable sub-units and buffer tubes; the plate shall provide various lances for hook-and-loop type strap installation to that end.
 - b. The door shall contain two slam latches (located on the left and right side of the door) that can individually be de-latched with single hand operation.
 - c. The door shall contain provisions for installation of a keyed lock assembly.
 - d. The door shall be removable from hinge pins by deflecting a metal stop-tab on the housing that can be flexed, permitting the door to slide laterally off of the hinge pins.
2. The housing shall contain a brushed entry on both sides of the rear of the housing that converges with the rear door and covers the full height of the housing.
 - a. The brushed entries shall be removable by sliding directly out from the housing after deflecting plastic retention tabs on the housing.
 - b. The brushed entries shall each be of a singular one-piece design that incorporates bristles that are two inches (50 mm) in length and are retained by a metal spine.
 - c. The bristles of the brushed entries shall be capable of preventing dust from accumulating on the interior of the housing.

T. 4U Top Access

The housing shall contain a removable top cover that slides on and off the rear assembly housing. The top cover shall contain relief holes on its left and right sides that will allow it to be held in place by flexible retention tabs on the left and right sides of the housing. The top cover shall contain two pass-through grommets on its rear edge.

U. 4U Cable Strain-relief

The housing shall provide means for strain-relieving fiber optic cables both interior and exterior to the rear of the housing.

1. External strain-relief shall be achieved through attachment of an external strain-relief bracket that slides onto either side of the housing and attaches in a tool-less "snap-on" manner via flexible retention tabs or buttons.
 - a. The external strain-relief bracket shall provide slots or holes for securing cables with hook-and-loop type straps.
 - b. The external strain-relief bracket shall provide threaded holes for attaching up to two cable clamps, as specified in Section 9.0, and accommodate a range of cable sizes.

2. Internal strain-relief shall be achieved through attachment of an internal strain-relief bracket that mounts on the floor of the rear assembly housing via retention tabs, feet or hooks and spring-loaded plunger.
 - a. The internal strain-relief bracket shall strain-relieve a single cable up to 34.0 mm or multiple cables of a comparable bundle diameter.
 - b. The internal strain-relief bracket shall incorporate slots for fast and unencumbered installation of rubber straps or hook-and-loop type straps and tape.
 - c. The internal strain-relief bracket shall contain a threaded hole for installation of central member and cable strength yarn strain-relief hardware.

V. 4U Interior Management

The rear housing assembly shall contain provisions for routing and maintaining fiber optic cable components, including cable sub-units and buffer tubes, 900 μ m optical fiber, and buffer tube transition kits.

1. The floor/base of the rear assembly housing shall provide holes or slots for the installation (and removal) of fiber retention or slack management clips.
 - a. The fiber retention clip shall be made from flexible, durable injection-molded plastic.
 - b. The fiber retention clip shall incorporate flexible fingers on the top that allow the quick removal and installation of optical fiber and cable sub-units.
 - c. The fiber retention clip shall be of a segmented design with a divider that separates the clip into two sections for greater organized fiber storage capacity.
2. The floor/base of the rear assembly housing shall provide holes or slots for the installation (and removal) of transitional strain-relief clips.
 - a. The transitional strain-relief clip shall be made from flexible durable injection-molded plastic.
 - b. The transitional strain-relief clip shall be capable of holding six (6) buffer tube transition kits that can each manage a single twelve-fiber buffer tube.
 - c. Fiber fan-out devices are used to build 250 μ m fiber in buffer tubes out to 900 μ m for fiber protection and to allow connectorization.
3. The transitional strain-relief clip shall be stackable utilizing only the integral retention features to affix the clips to one another.

W. 4U Mounting Provisions

1. The housing shall be mountable in an EIA-310 compatible 465 or 592mm rack.
 - a. The housing shall be mounted with a 5-inch (13 cm) frontal projection with the option to flush mount through removal of the front jumper assembly.
 - b. The mounting brackets shall incorporate slots that allow pre-installation of the mounting screws prior to attachment of the mounting brackets to the rack or frame.
 - c. The mounting brackets shall slide into the side of the housing and attach in a tool-less "snap-on" manner via flexible retention tabs or buttons.

- d. The rear housing assembly shall be removable from the mounting brackets through depressing internal buttons on both sides of the housing and sliding the housing off of the mounting brackets.
- e. For full-flush mounting and partial flush-mounting (3-inch/8 cm) the housing shall be available with optional accessory brackets that include openings that preserve jumper egress on both sides of the housing.

X. 4U Dimensions

1. The housing shall not exceed a depth requirement of 16.5 inches (42.0 cm), excluding door latches and locks.
2. The housing shall not exceed a width requirement of 17.5 inches (44.5 cm), excluding mounting brackets, fasteners or entry grommets.

Y. 4U Materials and Compliance

1. The unit shall meet the design requirements of ANSI/TIA/EIA-568 and the plastics flammability requirements of UL 94 V-0.
2. The connector housings shall have a labeling scheme that complies with ANSI/TIA/EIA-606.
3. The housing shall contain the following labels that shall be affixed to the base of the front compartment of the housing:
 - a. A laser radiation warning label that contains the word "DANGER" in a highlighted color or colored background (preferably red).
 - b. A UL listing label that lists the product as a communication circuit accessory (listing 41S4 or equivalent).
 - c. A product information label that contains the manufacturer's name, product part number, manufacturing location, date of manufacturer, as well as other pertinent information for manufacturing traceability.
4. The housing and/or packaging shall include a hardware accessory kit that includes the following components:
 - a. installation instructions
 - b. fiber optics label
 - c. Hook-and-loop type straps
 - d. #12-24 mounting screws
5. Housings shall be manufactured using materials and colors per Table 4 for structural integrity and shall be finished with a wrinkled black powder coat for durability on exterior metal. Installation fasteners shall be included and shall be black in color

Attribute	Top Cover	Front Door	Rear Door	Base Housing	Jumper Housing	Related Brackets
Material:	Metal (2)	Plastic (1)	Metal (2)	Metal (2)	Metal (3)	Metal (4)
Color, Exterior:	Black, <u>Corvel</u>	Clear, Tinted	Black, <u>Corvel</u>	Black, <u>Corvel</u>	Black, <u>Corvel</u>	Black, <u>Corvel</u>
Finish:	Midnight Wrinkle	Flat/ Smooth	Midnight Wrinkle	Midnight Wrinkle	Midnight Wrinkle	Midnight Wrinkle
Color, Interior:	Platinum	N/A	Black, <u>Corvel</u>	Platinum	Platinum	N/A
Material Notes:						
<i>(1) Plastic: Flame retardant, UV-stabilized polycarbonate (medium-viscosity)</i>						
<i>(2) Metal: Cold Rolled Steel, 18 Gauge</i>						
<i>(3) Metal: Aluminum, 16 Gauge</i>						
<i>(4) Metal: Cold Rolled Steel, 16 Gauge</i>						

Table 4: 4U Housing Materials

Z. Splice Cassettes

Rack mountable housings shall accept an interchangeable splice cassette. A splice cassette is defined as a removable module that is capable of holding a connector panel and splice organizer for pigtail and through splicing applications. The splice cassette shall have the following characteristics:

1. The splice cassette shall consist of a base constructed from injection-molded black plastic and a removable hinged lid or cover constructed from injection- molded tinted translucent plastic.
2. The splice cassette shall allow one connector panel (as described in Section 7.0) to be installed into the base.
3. The splice cassette shall be able to hold and contain at least one meter of pigtail fiber slack on the interior floor of the base.
4. The splice cassette shall be available with pre-installed connector pigtails and panels.
5. The splice cassette shall be able to hold and contain up to one meter of 2.0-3.0 mm buffer tube slack or jacketed pigtail slack (up to 24 fiber) on the exterior bottom of the base.
6. The splice cassette shall contain a pivoting (and removable) splice tray above the base in a horizontal position that rotates up into a vertical position at least 90 degrees relative to the base allowing access to the base.
 - a. The splice tray shall contain one interchangeable splice organizer capable of holding either up to (24) splice heat-shrinks or up to (6) ribbon fiber heat-shrinks.

- b. The splice tray shall contain routing tabs and provisions for holding a total of two meters of 250 or 900 μm fiber slack, or 12-fiber ribbon slack (includes both incoming and outgoing fiber slack).
 - c. The splice tray shall contain slots and provisions for installing hook-and-loop type straps for securing incoming and outgoing buffer tubes and/or jacketed optical fibers.
7. The splice cassette shall contain relief slots for holding up to two ribbon or buffer tube transition ("fan-out") kits on either side of the base.
8. The splice cassette shall contain two fiber retention tabs behind the connector panel location to maintain fiber below the connections and adapters in an installed connector panel.
9. The splice cassette shall contain two flexible curved tabs for grasping the cassette during installation and removal from the main connector housings.
10. The splice cassette shall contain integral slots on both sides of the cassette to hold and guide the cassette along tracks in the main connector housings.
11. The splice cassette lid/cover shall contain two retention tabs that snap onto the base and also provide slots for securing in a closed position with cable ties.
12. The splice cassette shall ship with a quick-start installation and routing label affixed to the lid/cover that is easily removable and leaves no residue or marking on the lid / cover.
13. The splice cassette shall have a permanent U.L. label affixed that contains the following information:
 - a. Okay U.L. Listing number 41s4 (Communication Circuit Accessory)
 - b. Country of Origin (for assembly)
 - c. Date and Lot number for manufacturing traceability
14. The splice cassette shall have a permanent Part Number label affixed that contains the following information:
 - a. Product part number (manufacturer's catalog number)
 - b. Product serial number
 - c. Country of manufacturer

AA. Slack Storage Cassettes

Rack mountable housings shall accept an interchangeable slack storage cassette. A slack storage cassette is defined as a removable module that is capable of holding a connector panel and cable sub-unit and/or fiber slack. The slack storage cassette shall have the following characteristics:

1. The slack storage cassette shall consist of a base constructed from injection- molded plastic and a removable hinged lid or cover constructed from injection- molded plastic.
2. The slack storage cassette shall allow one connector panel (as described in Section 7.0) to be installed into the base.
3. The slack storage cassette shall be able to hold and contain at least one meter of pigtail fiber slack on the interior floor of the base.
4. The slack storage cassette shall be able to hold and contain up to one meter of 2.0-3.0 mm buffer tube slack or jacketed pigtail slack (up to 24 fiber) on the exterior bottom of the base.
5. The slack storage cassette shall contain relief slots for holding up to two ribbon or buffer tube transition ("fan-out") kits on either side of the base.
6. The slack storage cassette shall contain two fiber retention tabs behind the connector panel location to maintain fiber below the connections and adapters in an installed connector panel.

7. The slack storage cassette shall contain two flexible curved tabs for grasping the cassette during installation and removal from the main connector housings.
8. The slack storage cassette shall contain integral slots on both sides of the cassette to hold and guide the cassette along tracks or rails in the main connector housing.
9. The slack storage cassette lid/cover shall contain two retention tabs that snap onto the base and also provide slots for securing in a closed position with cable ties.
10. The slack storage cassette shall ship with a quick-start installation and routing label affixed to the lid/cover that is easily removable and leaves no residue or marking on the lid / cover.
11. The slack storage cassette shall have a permanent U.L. label affixed that contains the following information:
 - a. U.L. Listing number 41s4 (Communication Circuit Accessory)
 - b. Country of Origin (for assembly)
 - c. Date and Lot number for manufacturing traceability
12. The slack storage cassette shall have a permanent Part Number label affixed that contains the following information:
 - a. Product part number (manufacturer's catalog number)
 - b. Product serial number
 - c. Country of manufacturer

BB. Connector Panels

Rack and wall mountable connector housings shall accept an interchangeable connector panel. A connector panel is defined as a modular removable plate containing optical fiber connector adapters. The connector panel shall have the following characteristics:

1. The connector panel shall utilize a single mounting footprint and shall be available with various connector adapters and different adapter counts in each panel.
2. The connector panel shall be interchangeable between the rack and wall- mountable hardware being proposed.
3. The panel shall be attached to the housing or splice or slack storage cassette with two push-pull latches to allow quick installation and removal.
4. The connector panel shall be available with industry standard single fiber and small form factor multi-fiber adapters.
5. Icons: For those panels that allow them, icons must be removable.
 - a. To identify the circuits, icons shall be available with the following symbols: blank, telephone, computer, and CATV.
 - b. The icons shall also be available in the following colors: yellow, red, green, blue, and white.
6. Panels shall be manufactured from injection molded plastic or from metal for structural integrity.
7. Panels shall be finished with a wrinkled black texture to match other hardware.
8. Blank connector panels shall be available to fill unused space within the housings.
 - a. The blank connector panel shall be attached with at least two spring clips to allow quick installation and removal.
 - b. Housings shall be supplied with blank connector panels for all available positions unless the housing is ordered with optical fiber adapters.

- c. The blank panels shall be manufactured from injection molded polycarbonate and shall be finished with a wrinkled black texture to match the housing.
9. Connector panel adapter fiber positions shall be numbered per the natural numbers starting with the number one and proceeding up to the maximum fiber capacity for the panel.
10. All connector panels shall ship with dust caps or covers installed in the fiber optic adapters or ports.

CC. Connector Modules

Rack mountable connector housings shall accept an interchangeable connector module. A connector module is defined as a modular removable case containing optical fiber connector adapters and provisions for strain-relief, slack storage, and the furcation of fiber optic cables. The connector module shall have the following characteristics:

1. The connector module shall consist of a panel built into a protective case with a removable cover for access to the interior connectors and fibers.
2. The connector module shall utilize a single mounting footprint and shall be available with various connector adapters and different adapter counts in each module.
3. The module shall be attached with two push-pull latches to allow quick installation and removal.
4. The connector module shall be available with industry standard single fiber and small form factor multi-fiber adapters.
5. The connector module shall include removable icons that identify the circuits.
 - a. As a minimum, these icons shall be available with the following symbols: blank, telephone, computer, or CATV.
 - b. The icons shall also be available in the following colors: yellow, red, green, blue, and white.
6. Modules shall be manufactured from 16 gauge cold rolled steel or injection molded plastic for structural integrity.
7. Modules shall be finished with a wrinkled black texture to match other hardware.
8. Modules shall be available in the following configurations: adapter modules, pigtailed modules, and pre-terminated system modules.
9. Connector module adapter fiber positions shall be numbered per the natural numbers starting with the number one and proceeding up to the maximum fiber capacity for the panel.
10. All connector modules shall ship with dust caps or covers installed in the fiber optic adapters or ports.

DD. Cable Clamping Mechanism

The housing shall include the capability to install a clamshell-type cable clamping mechanism to provide cable strain relief.

1. The cable clamp shall accept one cable from 9.5 to 28.6 mm in diameter.
2. The cable clamp mechanism shall also handle multiple smaller fiber count cables when used with the multiple cable insert, or through the application of friction tape to individual cables so as to form a single bundle that can be contained by the clamp.
3. The total cable capacity per clamp shall be five cables (whose individual diameter is up to 10.0 mm) when used with the multiple-cable insert.

4. Housing cable clamp capacity shall be at least two clamps per external strain-relief bracket for the housings; cable clamps shall be available as an accessory kit.

3.2.8 27 11 19 Communications Termination Blocks and Patch Panels

Adhere to the following general specifications:

- A. Panel shelves and wall-mount housing shall be used for a combination of splicing pigtailed, direct connector termination, or plug-and-play cabling. Shelf shall be designed for use as termination shelf only (direct connector termination) or as splice and termination shelf.
- B. Building riser cabling shall not terminate directly to equipment, and patch panels shall be installed at both the headend and remote locations. Panels shall be sized to match fiber and/or copper termination count of cable being installed as well as allow for future expansion.
- C. Optical splitter modules, if required, shall be utilized with integrated PON solutions:
 1. Shall be able to mount in panel shelves or panel housings
 2. Shall utilize the OS2 single-mode (OS2) fiber category
 3. Shall support SC APC or LC APC fiber connectors
 4. Shall utilize connected pigtail jumpers or support ports for fiber jumpers
 5. May utilize different split ratios based on project requirements such as 1x8 – 1x32
 6. Shall support a wavelength range of 1260-1360 and 1480-1626 nm
- D. Fiber terminations for converged solutions at a zone or end locations shall be terminated into appropriately sized fiber panels or small wall terminals.
- E. Fiber termination hardware
 1. Fiber connector housings:
 - a. Shall fit in standard 19 in racks or wall mountable housings.
 - b. Shall hold 1 to 12 panels/modules/splice cassettes/splitters per housing.
 2. Fiber patch panels:
 - a. Shall support single-mode LC/APC and LC/UPC or SC/APC and SC/UPC adapters.
 - b. Shall support 12 or 24 counts
 - c. Shall support a patch panel option that can mount up to 6 keystone modules for fiber or DC power patching
 3. Fiber splice cassettes:
 - a. Shall support single-mode LC/APC and LC/UPC or SC /APC and SC/UPC adapters.
 - b. Shall support 12 or 24 counts
 - c. Shall support fusion splicing for individual or ribbon fibers.

3.2.9 27 13 23.25 Fiber Optic Connectors

- A. General Specifications
 1. Connectors shall be field-installable no-epoxy/no-polish LC, SC, or ST connectors and meet all requirements in this specification
 2. The following documents may be used as references.
 - a. EIA/TIA-455-A Standard Test Procedures for Optical Fiber Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components (FOTPs)

- b. TIA/EIA-604-2 Fiber Optic Connector Intermateability Standard, FOCIS-2 (ST Compatible)
 - c. TIA/EIA-604-3A Fiber Optic Connector Intermateability Standard, FOCIS-3 (Type SC)
 - d. TIA/EIA-604-10A Fiber Optic Connector Intermateability Standard, FOCIS-10 (Type LC)
- B. Design Specifications: Corning Cable Systems UniCam connectors
- C. Physical Specifications
- 1. The connector shall provide a strain relief mechanism for installation on 900um buffered fiber or single fiber cable that contains strength elements. The fiber within the body of the connector shall be isolated mechanically from cable tension, bending and twisting.
 - 2. The connector shall be designed to comply with the appropriate TIA/EIA FOCIS document.
 - 3. The ST compatible, SC and LC connectors shall secure to the field fiber via a rotating cam which shall be situated on the connector body and the camming action shall be performed with the use of a connector terminating tool designed for that purpose. Upon rotation of the cam, the connector shall then be permanently secured to the fiber by the crimping of the connector lead in tube via the connector terminating tool.
 - 4. The connector ferrule shall be made from a homogenous polymer or ceramic material
- D. Installation Specifications
- 1. The ST compatible, SC, and LC connectors shall be installable upon 900 µm buffered fiber in one minute or less.
 - 2. The connector installation tool kit shall be able to be used to terminate all of the above connector types. The tool shall contain an integrated continuity test system, to provide immediate Go/No-Go feedback of successful connectivity.
 - 3. The connector shall not require polishing of the endface in the field. Connectors shall have a factory-polished fiber stub in the connector ferrule.
 - 4. The connector installation shall not require the use of epoxies.
- E. The connector shall be available in individual single-packages, or in bulk organizer packs of 25. The packaging will indicate the supplier part number, connector type, and date code.
- F. Performance Requirements
- 1. Connectors shall comply with the following insertion loss performance when testing in accordance with FOTP-171
 - a. Singlemode: ≤ 0.2 dB (average) and ≤ 0.5 dB (maximum)
 - b. Multimode: ≤ 0.1 dB (average) and ≤ 0.5 dB (maximum)
 - 2. Connectors shall comply with the following performance testing in Table 4.

Table 4: Performance Test Requirements for Connectors

Test	Test Method (FOTP #)	Test Conditions	Requirement*
Insertion Loss (IL)	171	concatenation method	<u>Average</u> : 0.1 dB Max IL : 0.5 dB
Return Loss (RL)	107	coupler with power source and meter	Minimum RL: ≤-20 dB Minimum RL: ≤-26 dB LOMMF
Low Temp Soak	188	4 days @ 0°C	Max IL : 0.75 dB Min RL: 20 dB
Temperature Life	4	4 days @ 60°C	Max IL : 0.75 dB Min RL: 20 dB
Humidity	5	4 days @ 40°C RH 90-95%	Max IL : 0.75 dB Min RL: 20 dB
Impact	2	8 impacts from 1.8 meters (height)	Max IL : 0.75 dB Min RL: 20 dB
Strength of Coupling Mech.	185	33 N at 0° for 5 seconds	Max IL : 0.75 dB Min RL: 20 dB
Durability	21	500 rematings, clean every 25	Max IL : 0.75 dB Min RL: 20 dB
Cable Retention 0°	6	0.5 lb. on 900 μm buffered fiber for 5 seconds	Delta IL: ≤ 0.5 dB Max IL: 0.75 dB Min RL: 20 dB
Cable Retention 90°	6	0.5 lb. on 900 μm buffered fiber for 5 seconds	Delta IL: ≤ 0.5 dB Max IL: 0.75 dB Min RL: 20 dB
Flex	1	±90° for 100 cycles @ 0.5 lb. load on 900 μm buffered fiber	Max IL : 0.75 dB Min RL: 20 dB
Twist	36	10 <u>cycles</u> 5 turns, 0.5 lb. load on 900 μm buffered fiber	Max IL : 0.75 dB Min RL: 20 dB

3.2.10 27 13 23.30 Fiber Optic Adapter Panels

A. General Specifications

1. Rack and wall mountable connector housings shall accept an interchangeable connector panel. An adapter panel is defined as a modular removable plate containing optical fiber connector adapters.

2. Fiber optic adapter panels shall meet all requirements in this specification
- B. Design Specifications: Corning Cable Systems LANscape CCH Adapter Panels and Pigtailed Panels
- C. Physical Specifications
1. The adapter panel shall utilize a single mounting footprint and shall be interchangeable between the rack and wall mountable hardware used.
 2. The panel shall be attached with two push-pull latches to allow quick installation and removal.
 3. The adapter panel shall be available with industry standard single fiber and small form factor multi-fiber adapters, including the SC duplex, ST compatible, LC duplex and MTP.
 4. The adapter panel shall accommodate OM3, OM4, and OS2 optical fiber.
 5. Panels shall be manufactured from injection molded polycarbonate for structural integrity.
 6. Panels shall be finished with a wrinkled black texture.
 7. Pigtailed panel shall consist of an adapter panel as described above, factory-loaded with factory-terminated pigtails, 3 m in length. The pigtails shall be available in a variety of cable options, a MIC® Cable subunit or ribbon fiber.
 8. Blank adapter panels shall be available to fill unused space within housings. The blank panels shall be manufactured from injection molded polycarbonate and shall be finished with a wrinkled black texture to match the housing. Housings shall be supplied with blank adapter panels for all available positions unless the housing is ordered with optical fiber adapters panels pre-installed. The blank panel shall be attached with at least two spring clips to allow quick installation and removal.

3.2.11 27 13 23.32 Fiber Optic Splice Cassettes

- A. General Specifications
1. Rack mountable housings shall accept an interchangeable splice cassette. A splice cassette is defined as a removable module that is capable of holding a connector panel and splice organizer for pigtail and through splicing applications.
 2. Fiber optic splice cassettes shall meet all requirements in this specification
- B. Design Specifications: Corning Cable Systems LANscape CCH Splice Cassettes
- C. Physical Specifications
1. The splice cassette shall consist of a base constructed from injection-molded black plastic and a removable hinged lid or cover constructed from injection-molded tinted translucent plastic.
 2. The splice cassette shall be available with pre-installed connector pigtails and panels.
 3. The splice cassette shall allow one connector panel (as described in 27 13.23.30) to be installed into the base.
 4. The splice cassette shall be able to hold and contain at least one meter of pigtail fiber slack on the interior floor of the base.
 5. The splice cassette shall be able to hold and contain up to one meter of 2.0-3.0 mm buffer tube slack or jacketed pigtail slack (up to 24 fiber) on the exterior bottom of the base.
 6. The splice cassette shall contain a pivoting (and removable) splice tray above the base in a horizontal position that rotates up into a vertical position at least 90 degrees relative to the base allowing access to the base.
 - a. The splice tray shall contain one interchangeable splice organizer capable of holding up to (24) splice heat-shrinks, routing tabs and provisions for holding a total of two meters of 250 or 900 micron fiber slack, or 12-fiber ribbon slack (includes both incoming and

outgoing fiber slack) and contain slots and provisions for securing incoming and outgoing buffer tubes and/or jacketed optical fibers.

7. The splice cassette shall contain relief slots for holding up to two buffer tube transition ("fan-out") kits on either side of the base.
8. The splice cassette shall contain two fiber retention tabs behind the connector panel location to maintain fiber below the connections and adapters in an installed connector panel.
9. The splice cassette shall contain two flexible curved tabs for grasping the cassette during installation and removal from the main connector housings.
10. The splice cassette shall contain integral slots on both sides of the cassette to hold and guide the cassette along tracks in the main connector housings.
11. The splice cassette lid/cover shall contain two retention tabs that snap onto the base and also provide slots for securing in a closed position with cable ties ("ty-wraps").
12. The splice cassette shall have a permanent U.L. label affixed that contains the following information: U.L. Listing number 41s4 (Communication Circuit Accessory), Country of Origin (for assembly) and Date and Lot number for manufacturing traceability.
13. The splice cassette shall have a permanent Part Number label affixed that contains the following information: Product description, Product part number (manufacturer's catalog number), Product serial number, Country of manufacturer, and U.S. Patent number.

3.2.12 27 13 23.35 Fiber Optic Housings

A. General Specifications

1. Fiber Optic housings shall provide a means for securing, strain-relieving, protecting, and labeling of fiber optic cable terminations. Housings shall be available in both rack-mount and wall-mount configurations and accept one standard adapter panel footprint for all housings.
2. Fiber optic housings shall meet all requirements in this specification

B. Design Specifications

1. Corning Cable Systems Closet Connector Housing (CCH), rack-mount
2. Corning Cable Systems Wall-mount Connector Housing (WCH), wall-mount

C. Rack-Mount Housing Specifications

1. Housings shall be designed for rack-mounted or frame-mounted applications that support conventional cross-connection and interconnection schemes as well as splicing applications.
2. Housings shall be available in 1U, 2U, 3U and 4U. One industry standard (EIA compliant) rack unit or panel height (denoted as 1U) is defined as being 44.45 mm (1.75") in height in compliance with EIA-310-D ("Cabinets, Racks, Panels, and Associated Equipment").
3. The housings shall have capacity specifications as listed below in Table 5.

Table 5: Rack Mount Housing Fiber Capacity

Unit Size	Panel Capacity	Housing Fiber Capacity, using:		
		6f / panel	12f / panel	24f / panel
1U	2	12	24	48
2U	4	24	48	96
3U	6	36	72	144
4U	12	72	144	288

4. The housings shall meet the design requirements of ANSI/TIA/EIA-598 and the plastics flammability requirements of UL 94 V-0.
5. The connector housings shall have a labeling scheme that complies with ANSI/TIA/EIA- 606.
6. The housings shall be mountable in an EIA-310 compatible 465mm or 592mm rack.
 - a. The housings shall be mounted with a 12 cm frontal projection with the option to flush mount.
 - b. The mounting brackets shall incorporate tear-drop shaped slots that allow pre-installation of the mounting screws prior to attachment of the mounting brackets to the rack or frame, by symmetric and of the same design for either side of the housing, attach to the side of the housing via screws or fasteners for the 1U, 2U, and 3U, slide into the side of the housing and attach in a “snap-on” manner via flexible retention tabs or buttons for the 4U.
 - c. The 4U housing rear assembly shall be removable from the mounting brackets through depressing internal buttons on both sides of the housing and sliding the housing off of the mounting brackets.
7. The housings shall support cross-connection, inter-connection and/or splicing applications and routing schemes in the same housing.
 - a. The housings shall accommodate direct connectorization via connector panels as specified in 27 13 23.30.
 - b. The housings shall accommodate pigtail splicing and through splicing via interchangeable splice cassettes, as specified in 27 13 23.32.
8. 1U, 2U, and 3U Housings
 - a. The housings shall have removable top covers, front and rear doors, and a slide-out drawer or tray, and be fully accessible from the top, rear and front sides.
 - b. The housing’s slide-out tray shall provide jumper routing guides in the front to protect and manage jumpers.
 1. The slide-out tray shall incorporate and allow interchangeable attachment of three (3) jumper routing guides. They shall attach to either panel clip retention blocks or stackable rails. The routing guide shall incorporate an indentation on the top surface for grasping to manually assist with pulling out the sliding tray.

- c. The front of the housing and interior slide-out tray shall be accessible via a tinted translucent door. It shall also contain jumper egress openings on both sides.
 - 1. The door shall be removable from metal hinges by removing a single screw on each side of the door.
- d. The rear of the housings and interior slide-out tray shall be accessible via a metal door. The rear door shall incorporate pre-stamped punch-out openings that will allow fiber optic cable to enter the housing perpendicular to the rear of the housing.
 - 1. The rear door shall be removable from metal hinges by removing a single screw on each side of the door
- e. The top of the housings shall be accessible via two slide-out top covers that converge and interface in the center of the housings via two alternating support tabs.
 - 1. The top covers shall be made from tinted translucent injection-molded plastic and incorporate pockets or slots for containing two labels cards.
- f. The housing shall provide means for strain-relieving fiber optic cables.
- g. External strain-relief shall be achieved through attachment of an external strain-relief bracket that attaches onto either side of the housing via two fasteners.
 - 1. The external strain-relief bracket shall be of a two-piece design that allows disassembly and reassembly such that it can be used in a universal fashion on either side of the housing and with either top or bottom cable entry into the housing.
- h. Internal strain-relief shall be achieved through attachment of an internal strain relief bracket that mounts on the floor of the rear of the housing via retention studs and a spring-loaded plunger.
 - 1. The internal strain-relief bracket be installable on either side of the rear of the housing and of a singular design for either side and be removable and its support plate shall not interfere with removal or sliding action of the interior tray.
- i. The housing's interior tray shall contain provisions for routing and maintaining fiber optic cable components, including cable sub-units and buffer tuber, 900 um optical fiber, and buffer tube transition kits.
 - 1. The sliding tray of the housing shall provide holes or slots for the installation (and removal) of fiber retention or slack management clips.
 - 2. The sliding tray of the housing shall provide holes or slots for the installation (and removal) of transitional strain-relief clips
 - 3. The sliding tray shall contain an embossed pattern that conveys the routing path that optical fiber and cable sub-units should follow in routing from cable entry to the fiber optic panels contain within the housing.

9. 4U Housing

- a. The housing shall contain a front compartment whose function is to protect and manage jumpers that interface with the main housing behind it. The front jumper assembly compartment shall be removable and attached via mounting screws and support tabs and be accessible via a tinted translucent door.
- b. The front compartment shall contain jumper egress openings on both sides that are edged with rubber pass-through grommets that provide bend radius support for optical fiber jumpers, contain two pass-through grommets on the top for jumper egress to

other housings or equipment racks and contain four (4) jumper management routing clips on the floor and ceiling of the compartment.

1. The clips shall be spaced equidistant relative to one another, have flexible fingers permitting the installation and removal of jumpers and/or patchcords from the front of the clips and be capable of holding at least 144 (2.0 mm) jumpers or patchcords.
- c. The rear assembly housing shall be accessible via a metal door. The door shall contain a routing and cable sub-unit slack storage bracket for interior management of cable sub-units and buffer tubes.
- d. The housing shall contain a brushed entry on both sides of the rear of the housing.
- e. The housing shall contain a removable top cover.
- f. The housing shall provide means for strain-relieving fiber optic cables both interior to and exterior on the rear assembly housing.
1. External strain-relief shall be achieved through attachment of an external strain-relief bracket that slides onto either side of the housing and attaches in a "snap-on" manner via flexible retention tabs or buttons.
 2. Internal strain-relief shall be achieved through attachment of an internal strain-relief bracket that mounts on the floor of the rear assembly housing via retention tabs, feet or hooks and spring-loaded plunger.
- g. The rear of the housing shall contain provisions for routing and maintaining fiber optic cable components, including cable sub-units and buffer tubes, 900 um optical fiber, and buffer tube transition kits.
- h. The floor/base of the rear of the housing shall provide holes or slots for the installation (and removal) of fiber retention or slack management clips.
- i. The floor/base of the rear assembly housing shall provide holes or slots for the installation (and removal) of transitional strain-relief clips.
1. The transitional strain-relief clips shall be capable of holding six (6) buffer tube transition kits that can manage each manage a single twelve-fiber buffer tube. Fiber fan-out devices are used to build 250 um fiber in buffer tubes out to 900 um for fiber protection and to allow connectorization and be stackable utilizing only the integral retention features to affix the clips to one another.

END OF SECTION

3.2.13 27 13 23.60 Infrastructure Optical Performance

A. General Specifications

1. All products shall meet the requirements of this optical performance specification.

B. Cabling shall meet the performance specifications as stated below in Table 9.

Table 9: Bulk Cable Optical Performance

Optical Fiber Type	62.5 um MM	50um MM	50 um MM	50 um MM	Single-mode
ISO/IEC 11801 Nomenclature	OM1	OM2	OM3	OM4	OS2
Wavelength (nm)	850/1300	850/1300	850/1300	850/1300	1310/1383/1550
Minimum OFL Bandwidth (MHz*km)	200 / 500	700 / 500	1500 / 500	3500 / 500	-/-
Maximum Attenuation (dB/km)	3.4/1.0	3.0/1.0 2.8/1.0*	3.0/1.0 2.8/1.0*	3.0/1.0 2.8/1.0*	0.4/0.4/0.3 (LT/Ribbon) 0.65/0.65/0.5 (TB)
Minimum Effective Modal Bandwidth (MHz*km)	220 / -	950 / -	2000 / -	4700 / -	-/-
Serial 1GbE Distance (m)	300 / 550	750 / 600	1000 / 600	1100 / 600	5000 / - / -
Serial 10GbE Distance (m)	up to 33	up to 150	up to 300	up to 550	up to 550

* The following cables offer this improved attenuation performance: MIC, FREEDM One, FREEDM Fan-out, single-fiber and 2-fiber zipcord cables

C. Pre-terminated optical fiber systems shall meet the following performance specifications.

1. OM3 and OM4 Trunk Assemblies shall meet 0.75 ns skew (maximum) at a distance up to 300 meters
2. OM3 and OM4 Trunk Assemblies shall support 40/100G as stated in IEEE802.3
3. All components shall meet the maximum insertion loss values indicated in Table 10.

Table 10: Components Optical Specifications

Product Type	Insertion Loss, max (dB)	Bend Optimized OM3 and OM4 50um		Bend Optimized Single-Mode
High Density System	MTP® mated pair loss	0.35		0.75
	LC mated pair loss	0.15		0.5
	Module Loss	0.5		1.3
Standard Density System		Standard Loss	Low Loss	
	MTP® mated pair loss	0.5	0.35	0.75
	LC mated pair loss	0.25	0.15	0.5
	Module Loss	0.75	0.5	1.3

END OF SECTION

3.2.14 27 13 23.65 Polarity Management

A. General Specifications

1. All components in both the high-density and standard-density pre-terminated systems shall be manufactured such that transmit to receive polarity is managed when components are mated together, and polarity management method shall allow for concatenation of multiple components.

B. All MTP connectors shall mate key-up to key-down

C. The solution(s) shall not utilize any of the following techniques to achieve polarity management:

1. Pair-wise flips within the trunk assembly
2. "A" and "B" patchcords in the system (one straight through and one with a pairwise flip) or flip of patchcords in the field during installation
3. "A" & "B" modules and/or harnesses (one module/harness straight through and one with pairwise flips)
4. "A" and "B" installation orientation (modules and/or harnesses installed in one position at one end of the system and in a physically opposite orientation/position at the other end of the system)

END OF SECTION

3.2.15 26 27 00 Low-Voltage Distribution Equipment

3.2.15.1 26 27 26 Wiring Devices

- A. The network power solution shall be able to handle the internal termination of composite copper DC power and optical fiber cable without the use of third-party components.

3.2.15.2 26 27 33 Power Distribution Units

3.2.15.2.1 26 27 33.00.13 Network Power Supplies

- A. If allowed by the design, powered equipment included in this specification may be powered locally from assigned UPS/PDU outlets via cords and/or power supplies provided by the original equipment manufacturer (OEM). All other power must be supplied through one or more of the powering solutions below, using the recommended guidelines.
 1. Powered devices may receive their DC power from intermediate or centralized shelves. These shelves must contain the passive interconnect hardware (for connecting the horizontal cabling to the riser cabling) and provide DC power. Alternatively, the shelves may receive their DC power from separate passive hardware and commercially available fuse panels.
 2. The intermediate centralized shelf shall have the following characteristics:
 - a. Power input: 100-240 VAC, 50-60 Hz power, Maximum input current at 85 VAC is 16.8 amp with fully loaded 6 Power Supply Modules (PSMs).
 - b. Output: 12 DC ports – 57 VDC, 1.7 amp each, maximum 60 V (UL limit)
 - c. Physical characteristics
 1. Mounting: Rack mount – 19 in 1U
 2. Dimensions (H x W x D): 17 x 15 x 19.2 in (430.5 x 379.8 x 488 mm)
 3. Weight: 5.5 lb (2.5 kg) – without PSM
 3. Bulk power distribution
 - a. Shall consist of a transmitter and receiver that delivers power according to device requirements
 - b. Pulsed power transfer w/fault detection
 - c. Class 3 Power Supply
 - d. Complies with NEC 830.15 and IEC/UL 60950-1, -21 (RFT-V Circuits)
 - e. Shall perform fault detection test periodically, shutting down power until the fault is removed.
 - f. RX Characteristics
 1. Bridge-mode (for universal mains 90-240VDC)
 2. IP65 Enclosure
 3. Convection Cooled
 4. Op. Temp. Range -20 to 104°F (-29 to 40°C)
 - g. Distance and AWG – specify the power/distance/maximum wire size combination for the project or for generic reference, include a chart
 - h. GUI supports line card monitoring, alarming and control
 - i. TX to RX transport efficiency of at least 95%

END OF SECTION

4 APPENDIX

4.1 APPENDIX 1: APPROVED PRODUCT MANUFACTURERS

The following Product Manufacturers are approved for the City of Long Beach Structured Cabling System (SCS) to support all Telecommunications, and Information Communication Technology (ICT) infrastructure.

Substitutions will not be accepted without written approval by the City of Long Beach Telecommunications Division representative.

- A. COMMSCOPE SYSTIMAX
- B. CORNING
- C. Chatsworth Products Inc (CPI)
- D. Panduit
- E. Cooper B-Line
- F. CADDY
- G. HILTI

4.2 Appendix 2: CommScope Part Numbers

4.2.1 Data Communications Horizontal Cabling (Category 6/Class E)

- a. Approved Manufacturer: CommScope SYSTIMAX GigaSPEED XL CAT6

PLENUM	
Product #	Material ID
2071E LB 4/23 W1000	760191833
2071E BL 4/23 W1000	700208093
2071E WH 4/23 W1000	700208101
2071E YL 4/23 W1000	700210123
2071E SL 4/23 W1000	700214372
2071E OR 4/23 W1000	700210024
2071E LL 4/23 W1000	700210214
2071E RD 4/23 W1000	700210263
2071E BK 4/23 W1000	700210230
2071E SG 4/23 W1000	700210164

NON-PLENUM	
Product #	Material ID
1071E LB 4/23 W1000	700211964
1071E BL 4/23 W1000	760004689
1071E WH 4/23 W1000	700212046
1071E YL 4/23 W1000	700211998
1071E SL 4/23 W1000	700211931
1071E OR 4/23 W1000	700212103
1071E LL 4/23 W1000	700212095
1071E RD 4/23 W1000	700212020
1071E BK 4/23 W1000	700212129
1071E SG 4/23 W1000	700212061

b. Approved Manufacturer: CommScope CS34P I/O

CS34P-IO ([874049304/10](#)) Category 6 U/UTP 4/23 Indoor/Outdoor, BLACK

c. Approved Manufacturer: CommScope SYSTIMAX OSP CAT6

1571A BK 4/24 R1000 ([760008888](#)) Category 6 GigaSPEED XL® U/UTP OSP, BLACK

1571A BK 4/24 R3000 ([760090043](#)) Category 6 GigaSPEED XL® U/UTP OSP, BLACK

1572A BK 4/24 R1000 ([760170886](#)) Category 6 GigaSPEED XL® F/UTP OSP, BLACK

4.2.2 Data Communications Horizontal Cabling (Category 6A/Class EA)

a. Approved Manufacturer: CommScope SYSTIMAX GigaSPEED X10D

PLENUM	
Product #	Material ID
2091B LB 4/23 W1000	760154039
2091B BL 4/23 W1000	760107201
2091B WH 4/23 W1000	760107268
2091B YL 4/23 W1000	760107276
2091B SL 4/23 W1000	760107250
2091B OR 4/23 W1000	760107227
2091B PK 4/23 W1000	760118497
2091B RD 4/23 W1000	760107243
2091B BK 4/23 W1000	760185900
2091B GR 4/23 W1000	760107219

NON-PLENUM	
Product #	Material ID
1091B LB 4/23 W1000	760107102
1091B BL 4/23 W1000	760107094
1091B WH 4/23 W1000	760107144
1091B YL 4/23 W1000	760107151
1091B SL 4/23 W1000	760107078
1091B OR 4/23 W1000	760107128
1091B PK 4/23 W1000	760188276
1091B RD 4/23 W1000	760107136
1091B BK 4/23 W1000	760107086
1091B GR 4/23 W1000	760107110

b. Approved Manufacturer: CommScope CS44P I/O

CS44P-IO ([874036404/10](#)) Category 6A U/UTP 4/23 Indoor/Outdoor, BLACK

c. Approved Manufacturer: CommScope SYSTIMAX OSP F/UTP CAT6A

1592A BK 4/24 R1000 ([760178129](#)) 1592A Category 6A F/UTP Cable, outdoor, black jacket, aluminum tape

4.2.3 Category 5 Enhanced (5e)/Class D Outlets

a. Approved Manufacturer: CommScope SYSTIMAX

Color	Single	
Blue	MPS100E-318	108232778
Yellow	MPS100E-123	108232711

Color	Single	
Green	MPS100E-226	108232729
Ivory	MPS100E-246	108232737

Gray	MPS100E-270	108232752
White	MPS100E-262	108232745
Orange	MPS100E-112	108232703

Violet	MPS100E-361	108337726
Red	MPS100E-317	108232760
Black	MPS100E-003	108232695

4.2.4 Category 6/Class E Outlets

Approved Manufacturer: CommScope SYSTIMAX

Color	Single	
Blue	MGS400-318	700206758
Yellow	MGS400-123	700206691
Gray	MGS400-270	700206733
White	MGS400-262	700206725
Orange	MGS400-112	700206683
Almond	MGS400-148	760074211

Color	Single	
Green	MGS400-226	700206709
Ivory	MGS400-246	700206717
Violet	MGS400-361	700206675
Red	MGS400-317	700206741
Black	MGS400-003	700206667
Cream	MGS400-215	760070326

4.2.5 Category 6 Augmented (6A)/Class EA Outlets

a. Approved Manufacturer: CommScope SYSTIMAX

Color	Single	
Blue	MGS600-318	760092452
Yellow	MGS600-123	760092387
Gray	MGS600-270	760092437
White	MGS600-262	760092429
Orange	MGS600-112	760092379
Almond	MGS600-148	760092478

Color	Single	
Green	MGS600-226	760092403
Ivory	MGS600-246	760092411
Violet	MGS600-361	760092460
Red	MGS600-317	760092445
Black	MGS600-003	760092361
Cream	MGS600-215	760092395

4.2.6 Faceplates and Surface Mount Boxes (SMB)

a. Approved Manufacturer: CommScope (Following Catalog Number/Part numbers are provided as examples, see CommScope representative for assistance in selecting the proper faceplates and SMBs)

Faceplate physical specifications						
Product number	Port configuration	Port quantity	Port orientation	Box gang quantity	Available styles	Notes
Flush mounted modular faceplates—flat edge LE Series						
M10LE	simplex	1	NA	1	black	
M12LE	duplex	2	horizontal	1	creme	
M13LE	triplex	3	vertical	1	ivory	
M14LE	quadplex	4	square	1	white	ivory
M16LE	sixplex	6	vertical	1	gray	white
Flush mounted modular faceplates—beveled edge L Series						
M10L	simplex	1	NA	1	black	
M12L	duplex	2	horizontal	1	electrical ivory	
M13L	triplex	3	vertical	1	electrical white	
M14L	quadplex	4	square	1	electrical gray	ory
M16L	sixplex	6	vertical	1		hite
M28L	eightplex	8	horizontal	2		ray
M10LW	(wall phone) simplex	1	NA	1	electrical ivory	
M10LW	(wall phone) simplex	1	NA	1	electrical white	ivory
M12AP	duplex	2	vertical	1	electrical ivory	hite
M12AP	duplex	2	vertical	1	electrical white	ay
Flush mounted modular faceplates—flat edge M Series						
M13FP	single gang frame	NA	NA	1	black	
M26FP	double gang frame	NA	NA	2	ivory	
M30FP-1RJ45	single port adapter	1	NA	NA	white	al
M30FP-2RJ45	double port adapter	2	horizontal	NA	gray	te/gray
M30FP-SVHS	flush mount S-VHS adapter	1	NA	NA		ite-gray
M30FP-3RCA	3-port RCA adapter	3	horizontal	NA		creme
M30FP-VGA-PT	VGA adapter	1	NA	NA		hite
M30FP-BLANK	blank adapter	blank	NA	NA		ay
Flush mounted modular faceplates—stainless steel						
M12SP	duplex	2	horizontal	1	brushed stainless steel	almond
M13SP	triplex	3	vertical	1		hite
M14SP	quadplex	4	square	1		ry
M16SP	sixplex	6	vertical	1		
M30CC	simplex	1	MN	NA		ory
						electrical white
						electrical gray
						ivory

4.2.7 Dust Covers for Faceplates

- Approved Manufacturer: CommScope
- (Following Catalog Number/Part numbers are provided as examples, see CommScope representative for assistance in selecting the proper faceplates)

M20AP-246 [107067860](#) Ivory cover for empty faceplate openings

M21A-246 [108066457](#) Ivory cover for unpopulated jacks

4.2.8 Category 6 /Class E Patch Cords

1. Approved Manufacturer: CommScope
(The following Catalog/Part numbers are shown as examples, contact your CommScope Representative to specify correct Catalog/Part numbers)

A. CommScope Portfolio Reduced Diameter Patch Cords

Color	Product #	Material ID
Blue	MINO6-BL	CO166S2-0ZFxxx
White	MINO6-WH	CO166S2-08Fxxx
Yellow	MINO6-YL	CO166S2-09Fxxx
Dark Gray	MINO6-DG	CO166S2-03Fxxx
Spring Green	MINO6-SG	CO166S2-04Fxxx
Orange	MINO6-OR	CO166S2-06xxx
Purple	MINO6-PR	CO166S2-0Lxxx
Red	MINO6-RD	CO166S2-07xxx
Black	MINO6-BK	CO166S2-01xxx
Light Blue	MINO6-LB	CO166S2-02xxx

B. CommScope SYSTIMAX Standard Patch Cords

Color	Product #	Material ID
Blue	GS8E-BL	CPC3312-0ZFyyy
White	GS8E-WH	CPC3312-08Fyyy
Yellow	GS8E-YL	CPC3312-09Fyyy
Dk. Gray	GS8E-DG	CPC3312-03Fyyy
Green	GS8E-GN	CPC3312-04Fyyy
Color	Product #	Material ID
Orange	GS8E-OR	CPC3312-06Fyyy
Lilac	GS8E-LL	CPC3312-0BFyyy
Red	GS8E-RD	CPC3312-07Fyyy
Black	GS8E-BK	CPC3312-01Fyyy
Lt. Blue	GS8E-LB	CPC3312-02Fyyy

C. CommScope Ceiling Connector Assembly (CCA) for CAT6 UTP MPTL Links

Material ID	Product Number

		Environmental Space
760235585	CCA-GS8E-LSZH-BLACK-N018	LSZH
760235586	CCA-GS8E-LSZH-WHITE-N018	LSZH
760235587	CCA-GS8E-PLENUM-BLACK-N018	Plenum
760235588	CCA-GS8E-PLENUM-WHITE-N018	Plenum
760234921	Ceiling Connector Assembly (CCA) without cordage	Plenum/LSZH

4.2.9 Category 6 Augmented (6A)/Class EA Patch Cords

1. Approved Manufacturer: CommScope

(The following Catalog/Part numbers are shown as examples, contact your CommScope Representative to specify correct Catalog/Part numbers)

A. CommScope Portfolio Reduced Diameter Patch Cords

Color	Product #	Material ID
Blue	MiNo6A-BL	CO199K2-0ZFyyy
White	MiNo6A-WH	CO199K2-08Fyyy
Yellow	MiNo6A-YL	CO199K2-09Fyyy
Dark Gray	MiNo6A-DG	CO199K2-03Fyyy
Spring Green	MiNo6A-SG	CO199K2-04Fyyy

Orange	N/A	N/A
Purple	MiNo6A-VL	CO199K2-0LFyyy
Red	MiNo6A-RD	CO199K2-07Fyyy
Black	MiNo6A-BK	CO199K2-01Fyyy
Light Blue	MiNo6A-LB	CO199K2-02Fyyy

B. CommScope SYSTIMAX X10D CAT6A Standard Patch Cords

Color	Product #	Material ID
Blue	360GS10E-BL	CPCSSX2-0ZFyyy
White	360GS10E-WH	CPCSSX2-08Fyyy
Yellow	360GS10E-YL	CPCSSX2-09Fyyy
Dk. Gray	360GS10E-DG	CPCSSX2-03Fyyy
Green	360GS10E-GN	CPCSSX2-04Fyyy
Slate	360GS10E-SL	CPCSSX2-0CFyyy

Color	Product #	Material ID
Orange	360GS10E-OR	CPCSSX2-06Fyyy
Lilac	360GS10E-LL	CPCSSX2-0BFyyy
Red	360GS10E-RD	CPCSSX2-07Fyyy
Black	360GS10E-BK	CPCSSX2-01Fyyy
Lt. Blue	360GS10E-LB	CPCSSX2-02Fyyy

C. CommScope Ceiling Connector Assembly (CCA) for CAT6A UTP MPTL Links

Material ID	Product Number	Environmental Space
760235589	CCA-GS10E-LSZH-BLACK-N018	LSZH
760235590	CCA-GS10E-LSZH-WHITE-N018	LSZH
760235591	CCA-GS10E-PLENUM-BLACK-N018	Plenum
760235592	CCA-GS10E-PLENUM-WHITE-N018	Plenum
760234921	Ceiling Connector Assembly (CCA) without cordage	Plenum/LSZH

4.2.10 Patch Panels

A. Category 5e/Class D Patch Panels

a. CommScope SYSTIMAX Patch Panels

[Category 5e Universal Panels CPP-5E-DM-1U-24 \(760180000\)](#)
[Category 5e Universal Panels 1100-U-PS-24 \(760182907\)](#)
[Category 5e Universal Panels CPP-5E-DM-2U-48 \(760180018\)](#)
[Category 5e Universal Panels 1100-U-PS-48 \(760182915\)](#)

B. Category 6/Class E Patch Panels

a. CommScope SYSTIMAX Patch Panels

[360-IPR-1100-E-GS3-1U-24 \(760152561\)](#) GigaSPEED XL Cat 6 U/UTP, 24 port
[360-IPR-1100-E-GS3-2U-48 \(760152579\)](#) GigaSPEED XL Cat 6 U/UTP, 48 port

b. CommScope SYSTIMAX Angled Patch Panels

[360-IPR-1100A-E-GS3-1U-24 \(760151308\)](#) GigaSPEED XL Angled Cat 6 U/UTP, 24 port
[360-IPR-1100A-E-GS3-2U-48 \(760151753\)](#) GigaSPEED XL Angled Cat 6 U/UTP, 48 port

C. Category 6A/Class EA Patch Panels

a. CommScope SYSTIMAX Patch Panels

[360-IPR-1100-E-GS6-1U-24 \(760152587\)](#) GigaSPEED X10D Category 6A U/UTP, 24 port

[360-IPR-1100-E-GS6-2U-48 \(760152595\)](#) GigaSPEED X10D Category 6A U/UTP, 48 port

b. CommScope SYSTIMAX Angled Patch Panels

[360-IPR-1100A-E-GS6-1U-24 \(760151324\)](#) GigaSPEED X10D Ang CAT 6A U/UTP, 24 port

[360-IPR-1100A-E-GS6-2U-48 \(760151779\)](#) GigaSPEED X10D Ang CAT 6A U/UTP, 48 port

D. High Density CAT6A and CAT6 Modular Patch Panels

a. CommScope Patch Panel

[M4800-1U-GS \(760105429\)](#) 1U Modular Panel, 48 port, CAT 6A and 6 Info Outlets

[M2400-1U-GS \(760118323\)](#) 1U Modular Panel, 24 port, CAT 6A and 6 Info Outlets

b. CommScope Blank Modular CAT6 and CAT6A Panels

[360-E-MOD-2U-48 \(760187195\)](#) 2U SYSTIMAX 360™ Evolve 48-port flat panel

[360-E-MOD-1U-24 \(760187187\)](#) 1U SYSTIMAX 360™ Evolve 24-port flat panel

4.3 Appendix 3: Corning Part Numbers:

4.3.1 FREEDM® One Tight-Buffered Cables, Riser

Mechanical Characteristics Cable						
Fiber Count	Nominal Outer Diameter	Max. Tensile Strength, Short-Term	Max. Tensile Strength, Long-Term	Min. Bend Radius Installation	Min. Bend Radius Operation	Weight
2	5.2 mm (0.20 in)	675 N (150 lbf)	200 N (45 lbf)	78 mm (3.1 in)	52 mm (2.0 in)	20.5 kg/km (13.8 lb/1000 ft)
4	5.5 mm (0.22 in)	675 N (150 lbf)	200 N (45 lbf)	83 mm (3.2 in)	55 mm (2.2 in)	23.7 kg/km (15.9 lb/1000 ft)
6	5.5 mm (0.22 in)	675 N (150 lbf)	200 N (45 lbf)	83 mm (3.2 in)	55 mm (2.2 in)	25.7 kg/km (17.3 lb/1000 ft)
12	6.5 mm (0.26 in)	675 N (150 lbf)	200 N (45 lbf)	98 mm (3.8 in)	65 mm (2.6 in)	35.6 kg/km (23.9 lb/1000 ft)
18	7.4 mm (0.29 in)	1350 N (300 lbf)	400 N (90 lbf)	111 mm (4.4 in)	74 mm (2.9 in)	48.5 kg/km (32.6 lb/1000 ft)
24	8.0 mm (0.31 in)	1350 N (300 lbf)	400 N (90 lbf)	120 mm (4.7 in)	80 mm (3.1 in)	57.1 kg/km (38.4 lb/1000 ft)

4.3.1.1 Transmission Performance

Multimode					
Fiber Core Diameter (µm)	62.5	50	50	50	50
Fiber Category	OM1	OM2	OM3	OM4	OM4 Extended Distance
Fiber Code	K	T	T	T	T
Performance Option Code	30	31	80	90	91
Wavelengths (nm)	850/1300	850/1300	850/1300	850/1300	850/1300
Maximum Attenuation (dB/km)	3.4/1.0	2.8/1.0	2.8/1.0	2.8/1.0	2.8/1.0
Serial 1 Gigabit Ethernet (m)	300/550	750/600	1000/600	1000/600	1100/600
Serial 10 Gigabit Ethernet (m)	33/-	150/-	300/-	550/-	600/-
Min. Overfilled Launch (OFL) Bandwidth (MHz*km)	200/500	700/500	1500/500	3500/500	3500/500
Minimum Effective Modal Bandwidth (EMB) (MHz*km)	220/-	950/-	2000/-	4700/-	5350/-

Single-mode		
Fiber Name	SMF-28e® fiber	SMF-28® Ultra fiber
Fiber Category	G.652.D	G.652.D/G.657.A1
Fiber Code	E	Z
Performance Option Code	31	31
Wavelengths (nm)	1310/1383/1550	1310/1383/1550
Maximum Attenuation (dB/km)	0.65/0.65/0.50	0.65/0.65/0.50

4.3.2 MIC® 250 Distribution Cables, 12-144 Fibers

Mechanical Characteristics Cable				
Fiber Count	Nominal Outer Diameter	Min. Bend Radius Installation	Min. Bend Radius Operation	Weight
12	4.4 mm (0.17 in)	66 mm (2.6 in)	22 mm (0.9 in)	20.1 kg/km (13.5 lb/1000 ft)
24 - 36	9.0 mm (0.35 in)	135 mm (5.3 in)	90 mm (3.5 in)	70 kg/km (47.04 lb/1000 ft)
48	10.0 mm (0.40 in)	150 mm (5.9 in)	100 mm (3.9 in)	88.6 kg/km (59.5 lb/1000 ft)
72	12.0 mm (0.48 in)	180 mm (7.1 in)	120 mm (4.7 in)	132 kg/km (88.7 lb/1000 ft)
96	14.2 mm (0.56 in)	213 mm (8.4 in)	142 mm (5.6 in)	190.1 kg/km (127.9 lb/1000 ft)
144	15.8 mm (0.62 in)	237 mm (9.3 in)	158 mm (6.2 in)	214.4 kg/km (144.3 lb/1000 ft)

4.3.2.1 Transmission Performance

Multimode					
Fiber Core Diameter (µm)	62.5	50	50	50	50
Fiber Category	OM1	OM2	OM3	OM4	OM4 Extended Distance
Fiber Code	K	T	T	T	T
Performance Option Code	30	31	80	90	91
Wavelengths (nm)	850/1300	850/1300	850/1300	850/1300	850/1300
Maximum Attenuation (dB/km)	3.4/1.0	3.0/1.0	3.0/1.0	3.0/1.0	3.0/1.0
Serial 1 Gigabit Ethernet (m)	300/550	750/500	1000/600	1100/600	1100/600
Serial 10 Gigabit Ethernet (m)	33/-	150/-	300/-	550/-	600/-
Min. Overfilled Launch (OFL) Bandwidth (MHz*km)	200/500	700/500	1500/500	3500/500	3500/500
Minimum Effective Modal Bandwidth (EMB) (MHz*km)	220/-	950/-	2000/-	4700/-	5350/-

Single-mode			
Fiber Name	Single-mode (OS2)	ClearCurve® ZBL	SMF-28® Ultra fiber
Fiber Category	G.652.D	G.657.B3/G.652.D	G.657.A1
Fiber Code	E	U	Z
Performance Option Code	01	01	01
Wavelengths (nm)	1310/1383/1550	1310/1383/1550	1310/1383/1550
Maximum Attenuation (dB/km)	0.4/0.4/0.3	0.4/0.4/0.3	0.4/0.4/0.3
Typical Attenuation* (dB/km)	-	0.35/0.35/0.20	0.33/0.33/0.19

4.3.3 ActiFi™ Composite Cable, Loose Tube, Indoor/Outdoor, FREEDM® Riser 2 F, 2 Cu Conductor, 16AWG

A. Part Number:

1. 002ZTF-21Y01M20

Mechanical Specifications

Min. Bend Radius Installation	91.44 mm (3.6 in)
Min. Bend Radius Operation	60.96 mm (2.4 in)
Nominal Outer Diameter	6.1 mm (0.24 in)

Cable Design

Central Element	Jacketed GRP
Fiber Count	2
Buffer Tube Color Coding	Yellow
Number of Ripcords	1
Outer Jacket Color	Black
Outer Jacket Material	Flame-retardant
Buffer Tube Color	Yellow
Buffer Tube Diameter	1.6 mm (0.06 in)
Conductor	16 AWG
Number of Active Tubes	1
Number of Conductors	2
Number of Tube Positions	1
Fiber Coloring	Blue, Orange
Fibers per Tube	2

General Specifications

Environment	Indoor/Outdoor
Cable Type	Loose Tube
Fiber Category	SMF-28® Ultra fiber
Application	Vertical Riser

Optical Characteristics

Fiber Code	Z
Fiber Name	SMF-28® Ultra fiber
Fiber Type	Single-mode
Performance Option Code	01
Maximum Attenuation	0.4 dB/km / 0.4 dB/km / 0.3 dB/km
Wavelengths	1310 nm / 1383 nm / 1550 nm
Fiber Category	ITU-TG.657.A1

B. Composite Cable Ordering List

→ Selection Parameters →						← Output Information →													
Voltage Rating	Cable Type/ App	Conductor Count (# Cond.)	Conductor Size (AWG)	Fiber Count (ea)	Construction TB, LT	Part Number	Diameter (mm/in)	Weight (lb/1kft)	Minimum Bend Radius		MOQ (ft)	Maximum Production Length (ft)	Lead Time (weeks)						
									Installing (in)	Installed (in)									
300 VAC	Indoor Plenum (CL3P)	2	20	1F	TB	XXXZ48-21Z31M29	4.8 / 0.19	21.64	2.85	1.90	1182.00	9842.00	2 wks						
				2F			5.2 / 0.20	23.45	3.00	2.00	1182.00	9842.00							
				4F			5.3 / 0.21	25.27	3.15	2.10	1182.00	9842.00							
				6F			6.3 / 0.25	29.70	3.75	2.50	1182.00	9842.00							
				2F			5.6 / 0.22	32.93	3.30	2.20	1182.00	9842.00							
				6F			6.4 / 0.25	37.97	3.75	2.50	1182.00	9842.00							
		4	18	4F		6F	XXXZ48-41Z31M29	7.0 / 0.28	39.91	4.20	2.80	1182.00	9842.00	4-6 wks					
								2F	5.2 / 0.20	26.61	3.00	2.00	1182.00		9842.00				
								4F	5.6 / 0.22	28.49	3.30	2.00	1182.00		9842.00				
								6F	6.0 / 0.24	31.11	3.60	2.40	1182.00		9842.00				
								2F	6.7 / 0.26	34.67	3.90	2.60	1182.00		9842.00				
								4F	6.3 / 0.25	42.67	3.75	2.50	1182.00		9842.00				
		2	16	1F	2F	XXXZ48-41V31M29	7.1 / 0.28	46.50	4.20	2.80	1182.00	9842.00	4-6 wks						
							4F	7.7 / 0.30	49.59	4.50	3.00	1182.00		9842.00					
							6F	6.6 / 0.26	30.78	3.90	2.60	1182.00		4839.00					
							2F	6.9 / 0.27	41.73	4.05	2.70	1182.00		4839.00					
							2	20	2/4/6/8/12F	LT	XXXZT8-21Z01M20	5.8 / 0.23		26.66	3.45	2.30	1182.00	9842.00	4-6 wks
							4		2/4/6/8/12F			6.4 / 0.25		36.69	3.75	2.50	1182.00	9842.00	
		6	2/4/6/8/12F	7.0 / 0.28	45.65	4.20	2.80		1182.00			9842.00							
		12	6/12/24F	9.3 / 0.37	90.29	5.55	3.70		1182.00			9842.00							
		2	2/4/6/8/12F	6.2 / 0.24	27.54	3.60	2.40		1182.00			9842.00							
		4	4/6/8/12F	6.9 / 0.27	45.07	4.05	2.70		1182.00			9842.00							
		4	18	24F	XXXZT8-41V01M20	7.4 / 0.29	47.27	4.35	2.90		1182.00	9842.00	4-6 wks						
						2/4/6/8/12F	7.3 / 0.28	58.01	4.20		2.80	1182.00		9842.00					
						24F	8.7 / 0.34	70.03	5.10		3.40	1182.00		9842.00					
						12	6/12/24F	10.0 / 0.39	113.93		5.85	3.90		1182.00	9842.00				
						2	2/4/6/8/12F	6.6 / 0.26	34.74		3.90	2.60		1182.00	4839.00				
						4	4/6/8/12F	7.3 / 0.29	59.09		4.35	2.90		1182.00	4839.00				
		6	16	24F	XXXZT8-41Y01M20	7.8 / 0.31	60.56	4.65	3.10	1182.00	4839.00	4-6 wks							
						2/4/6/8/12F	7.6 / 0.30	78.38	4.50	3.00	1182.00		4839.00						
						24F	9.0 / 0.35	90.70	5.25	3.50	1182.00		4839.00						
						12	6/12/24F	11.2 / 0.44	157.53	6.60	4.40		1182.00	4839.00					

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→ Selection Parameters ←		← Output Information →											
Voltage Rating	Cable Type/ App	Conductor Count (# Cond.)	Conductor Size (AWG)	Fiber Count (ea)	Construction TB, LT	Part Number	Diameter (mm/in)	Weight (lb/1kft)	Minimum Bend Radius		MOQ (ft)	Maximum Production Length (ft)	Lead Time (weeks)
									Installing (in)	Installed (in)			
300 VAC	Indoor Plenum (CL3P)	2	14	4/6/8/12F	LT	XXXZD8-21X01M20	8.3 / 0.33	58.47	4.95	3.30	1182.00	2411.00	4-6 weeks
				24F			9.1 / 0.36		67.38	5.40		3.60	
		4		2/4/6/8/12F		XXXZD8-41X01M20	9.5 / 0.38	93.47	5.70	3.80	1182.00	2411.00	
							24F		10.5 / 0.41	101.87	6.15	4.10	
		6		2/4/6/8/12F		XXXZD8-61X01M20	11.2 / 0.44	142.35	6.60	4.40	1182.00	2411.00	
							24F		12.5 / 0.49	154.24	7.35	4.90	
		12	6/12/24F	XXXZD8-M1X01M20		14.0 / 0.55	254.04	8.25	5.50	1182.00	2411.00		
						2		2/4/6/8/12F	XXXZD8-21W01M20	10.3 / 0.41	100.95	6.15	
		4	2/4/6/8/12F	XXXZD8-41W01M20			11.5 / 0.45			112.56		6.75	
						6	2/4/6/8/12F	XXXZD8-61W01M20	11.0 / 0.43		152.27	6.45	
		12	6/12/24F	XXXZD8-M1W01M20					12.0 / 0.47	163.01		7.05	
						2	2/4/6/8/12F	XXXZD8-21M01M20	12.0 / 0.47		205.35	7.05	
	4	2/4/6/8/12F	XXXZD8-41M01M20	13.0 / 0.51	216.14				7.65	5.10		1182.00	2033.00
				6		2/4/6/8/12F	XXXZD8-61M01M20	16.0 / 0.63	375.14	9.45	6.30	1182.00	2033.00
	12	6/12/24F	XXXZD8-M1M01M20		5.3 / 0.21			22.22		3.15	2.10	1182.00	9842.00
				FREEDM* Riser: Indoor/ Outdoor (CL3R)	20	2	2/4/6/8/12F		LT	XXXZTF-41Z01M20	6.0 / 0.24	34.83	3.60
	4	2/4/6/8/12F	XXXZTF-61Z01M20					6.9 / 0.27			45.91		4.05
						6	2/4/6/8/12F	XXXZTF-M1Z01M20		9.0 / 0.35		82.66	5.25
	12	6/12/24F	XXXZTF-21V01M20							6.3 / 0.25	29.90		3.75
						2	2/4/6/8/12F	XXXZTF-41V01M20		7.0 / 0.28		46.13	4.20
	4	2/4/6/8/12F	XXXZTF-61V01M20							8.2 / 0.32	66.83		4.80
					6	2/4/6/8/12F	XXXZTF-M1V01M20	10.0 / 0.39		110.12		5.85	3.90
	12	6/12/24F	XXXZTF-21Y01M20					7.0 / 0.28			39.63	4.20	2.80
					16	2	2/4/6/8/12F	XXXZTF-41Y01M20		7.5 / 0.30		42.97	4.50
	4	2/4/6/8/12F	XXXZTF-61Y01M20							7.7 / 0.30	60.77		4.50
						6	2/4/6/8/12F	XXXZTF-M1Y01M20		8.7 / 0.34		89.99	5.10
	12	6/12/24F	XXXZDF-21X01M20							11.2 / 0.44	152.83		6.60
				14		2	2/4/6/8/12F	XXXZDF-41X01M20	8.0 / 0.31	58.13		4.65	3.10
	4	4/6/8/12F	XXXZDF-61X01M20						8.6 / 0.34		65.92	5.10	3.40
					6	4/6/8/12F	XXXZDF-81X01M20	9.9 / 0.39	95.15	5.85		3.90	1182.00
	12	6/12/24F	XXXZDF-M1X01M20					10.7 / 0.42		102.95	6.30	4.20	1182.00
					12	2	2/4F	XXXZDF-21W01M20	11.3 / 0.44		147.74	6.60	4.40
	4	2/4/6/8/12F	XXXZDF-41W01M20						14.2 / 0.56	247.15		8.40	5.60
				6		4/6/8F	XXXZDF-61W01M20	9.0 / 0.35	83.79		5.25	3.50	1182.00
	12	6/12F	XXXZDF-81W01M20					9.0 / 0.35		89.57	5.25	3.50	1182.00
				4		2/4/6/8/12F	XXXZDF-M1W01M20	10.9 / 0.43	137.28		6.45	4.30	1182.00
	6	4/6/8F	XXXZDF-21M01M20					12.5 / 0.49		164.16	7.35	4.90	1182.00
				12	6/12F	XXXZDF-41M01M20	13.3 / 0.52	156.03	7.80		5.20	1182.00	2033.00
	2	2/4F	XXXZDF-61M01M20				13.3 / 0.52		161.63	7.80	5.20	1182.00	2033.00
				4	2/4/6/8/12F	XXXZDF-81M01M20	14.8 / 0.58	186.66		8.70	5.80	1182.00	2033.00
	6	4/6/8F	XXXZDF-M1M01M20				17.9 / 0.70		356.08	10.50	7.00	1182.00	2033.00
				12	6/12F	XXXZDF-21Y01M20	17.9 / 0.70	367.03		10.50	7.00	1182.00	2033.00

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		→ Selection Parameters →				← Output Information →										
Voltage Rating	Cable Type/ App	Conductor Count (# Cond.)	Conductor Size (AWG)	Fiber Count (ea)	Construction TB, LT	Part Number	Diameter (mm/in)	Weight (lb/1kft)	Minimum Bend Radius		MOQ (ft)	Maximum Production Length (ft)	Lead Time (weeks)			
									Installing (in)	Installed (in)						
300 VAC	Armor Indoor Plenum (CL3P)	2	20	1F	TB	XXXZ48-21Z31MA3	11.3 / 0.44	65.92	6.60	4.40	1182.00	9842.00	2 weeks			
				2F			11.3 / 0.44	66.93	6.60	4.40	1182.00	9842.00				
				4F			11.3 / 0.44	68.14	6.60	4.40	1182.00	9842.00				
		4	20	6F		TB	XXXZ48-41Z31MA3	11.3 / 0.44	71.09	6.60	4.40	1182.00	9842.00	4-6 weeks		
				2F				11.3 / 0.44	73.51	6.60	4.40	1182.00	9842.00			
				4F				11.3 / 0.44	76.87	6.90	4.60	1182.00	9842.00			
		6F	20	12.4 / 0.49			TB	XXXZ48-21V31MA3	11.8 / 0.46	83.79	7.35	4.90	1182.00	9842.00	4-6 weeks	
				11.3 / 0.44					69.28	6.60	4.40	1182.00	9842.00			
				11.3 / 0.44					70.49	6.60	4.40	1182.00	9842.00			
		2	18	4F				TB	XXXZ48-21V31MA3	11.8 / 0.46	75.80	6.90	4.60	1182.00	9842.00	4-6 weeks
				6F						12.6 / 0.50	81.64	9.00	6.00	1182.00	9842.00	
				2F						11.8 / 0.46	83.59	6.90	4.60	1182.00	9842.00	
		4	18	4F	TB				XXXZ48-41V31MA3	13.7 / 0.54	94.75	8.10	5.40	1182.00	9842.00	4-6 weeks
				6F						13.7 / 0.54	96.76	8.10	5.40	1182.00	9842.00	
				2F						11.3 / 0.44	72.10	6.90	4.60	1182.00	4839.00	
		2	16	2F		TB			XXXZ68-21Y31MA3	12.4 / 0.49	85.00	6.90	4.60	1182.00	4839.00	2 weeks
				2/4/6/8/12F						11.9 / 0.47	60.19	7.05	4.70	1182.00	9842.00	
				4						12.4 / 0.49	105.46	7.35	4.90	1182.00	9842.00	
		6	20	2/4/6/8/12F			TB		XXXZT8-61Z01MA3	13.0 / 0.51	117.73	7.65	5.10	1182.00	9842.00	4-6 weeks
				6/12/24F						15.7 / 0.62	179.59	9.30	6.20	1182.00	9842.00	
				2						12.4 / 0.48	96.12	7.20	4.80	1182.00	9842.00	
		4	18	4/6/8/12F				TB	XXXZT8-41V01MA3	13.0 / 0.51	117.06	7.65	5.10	1182.00	9842.00	4-6 weeks
				24F						14.3 / 0.56	127.54	8.40	5.60	1182.00	9842.00	
				2/4/6/8/12F						14.3 / 0.56	138.82	8.40	5.60	1182.00	9842.00	
		6	18	24F	TB				XXXZT8-61V01MA3	15.7 / .061	159.86	9.15	6.10	1182.00	9842.00	4-6 weeks
				6/12/24F						22.9 / 0.90	229.05	13.50	9.00	1182.00	9842.00	
				2						12.4 / 0.49	95.77	7.35	4.90	1182.00	4839.00	
		4	16	4/6/8/12F		LT			XXXZT8-21Y01MA3	13.2 / 0.52	135.69	7.80	5.20	1182.00	4839.00	2 weeks
				24F						14.3 / 0.56	141.22	8.40	5.60	1182.00	4839.00	
				2/4/6/8/12F						14.3 / 0.56	160.01	8.40	5.60	1182.00	4839.00	
		6	16	24F			LT		XXXZT8-61Y01MA3	15.7 / 0.62	120.60	9.30	6.20	1182.00	4839.00	4-6 weeks
				6/12/24F						17.2 / 0.68	257.68	10.20	6.80	1182.00	4839.00	
				2						14.3 / 0.56	138.33	8.40	5.60	1182.00	2411.00	
		4	14	4/6/8/12F				LT	XXXXD8-21X01MA3	15.7 / 0.62	156.15	9.30	6.20	1182.00	2411.00	4-6 weeks
				24F						15.7 / 0.62	182.67	9.30	6.20	1182.00	2411.00	
				2/4/6/8/12F						17.2 / 0.68	200.68	10.20	6.80	1182.00	2411.00	
6	14	24F	LT	XXXZD8-61X01MA3	17.2 / 0.68				241.18	10.20	6.80	1182.00	2411.00	4-6 weeks		
		2/4/6/8/12F			19.4 / 0.76				178.47	11.40	7.60	1182.00	2411.00			
		12			6/12/24F				21.3 / 0.84	402.11	12.60	8.40	1182.00		2411.00	

		→ Selection Parameters ←			← Output Information →									
Voltage Rating	Cable Type/ App	Conductor Count (# Cond.)	Conductor Size (AWG)	Fiber Count (ea)	Construction TB, LT	Part Number	Diameter (mm/in)	Weight (lb/1kft)	Minimum Bend Radius		MOQ (ft)	Maximum Production Length (ft)	Lead Time (weeks)	
									Installing (In)	Installed (In)				
300 VAC	Armor FREEDM® Riser (CL3R)	2	12	2/4/6/8/12F	LT	XXXZD8-21W01MA3	172 / 0.68	199.78	10.20	6.80	1182.00	2033.00	4-6 weeks	
				24F			179 / 0.70	216.20	10.50	7.00	1182.00	2033.00		
		4	2/4/6/8/12F	XXXZD8-41W01MA3		172 / 0.68	250.37	10.20	6.80	1182.00	2033.00			
			24F			179 / 0.70	284.53	10.50	7.00	1182.00	2033.00			
		6	2/4/6/8/12F	XXXZD8-61W01MA3		179 / 0.70	328.30	10.50	7.00	1182.00	2033.00			
			24F			19.4 / 0.76	351.44	11.40	7.60	1182.00	2033.00			
		12	6/12/24F	XXXZD8-M1W01MA3		24.1 / 0.95	543.89	14.25	9.50	1182.00	2033.00			
		2	2/4/6/8/12F	XXXZTF-21Z01MA1		13.1 / 0.52	89.22	7.80	5.20	1182.00	9842.00	2 weeks		
		4	2/4/6/8/12F	XXXZTF-41Z01MA1		14.1 / 0.56	108.94	8.40	5.60	1182.00	9842.00			
		6	20	2/4/6/8/12F		XXXZTF-61Z01MA1	16.0 / 0.63	129.53	9.45	6.30	1182.00	9842.00		4-6 weeks
				6/12F		XXXZTF-M1Z01MA1	15.7 / 0.62	165.82	9.30	6.20	1182.00	9842.00		
				24F		15.7 / 0.62	165.15	9.30	6.20	1182.00	9842.00			
		2	18	2/4/6/8/12F		XXXZTF-21V01MA1	12.4 / 0.48	93.10	7.20	4.80	1182.00	9842.00	4-6 weeks	
				4		2/4/6/8/12F	XXXZTF-41V01MA1	14.3 / 0.56	120.69	8.40	5.60	1182.00		9842.00
				6		2/4/6/8/12F	XXXZTF-61V01MA1	15.7 / 0.61	149.76	9.15	6.10	1182.00		9842.00
				12		6/12/24F	XXXZTF-M1V01MA1	17.2 / 0.67	202.03	10.05	6.70	1182.00		9842.00
		2	16	2/4/6/8/12F		XXXZTF-21Y01MA1	13.1 / 0.52	102.58	7.80	5.20	1182.00	4839.00	2 weeks	
				24F		13.1 / 0.52	107.77	7.80	5.20	1182.00	4839.00			
		4	16	2/4/6/8/12F		XXXZTF-41Y01MA1	14.1 / 0.56	130.81	8.40	5.60	1182.00	4839.00	4-6 weeks	
				2/4/6/8/12F		XXXZTF-61Y01MA1	16.0 / 0.63	173.61	9.45	6.30	1182.00	4839.00		
		6	16	2/4/6/8/12F		XXXZTF-M1Y01MA1	17.2 / 0.68	245.54	10.20	6.80	1182.00	4839.00	4-6 weeks	
				6/12F		17.2 / 0.68	243.11	10.20	6.80	1182.00	4839.00			
		2	14	2/4/6/8/12F		XXXZDF-21X01MA1	14.1 / 0.56	132.22	8.40	5.60	1182.00	2411.00	4-6 weeks	
				24F		16.0 / 0.63	144.33	9.45	6.30	1182.00	2411.00			
		4	14	4/6/8/12F		XXXZDF-41X01MA1	16.6 / 0.65	180.11	9.80	6.54	1182.00	2411.00		
				24F		17.4 / 0.68	191.95	10.20	6.80	1182.00	2411.00			
		6	14	4/6/8/12F		XXXZDF-61X01MA1	17.2 / 0.68	239.64	10.20	6.80	1182.00	2411.00		
				6/12/24F		XXXZDF-M1X01MA1	21.3 / 0.84	363.56	12.60	8.40	1182.00	2411.00		
		2	12	2/4F		XXXZDF-21W01MA1	15.7 / 0.62	166.53	9.30	6.20	1182.00	2033.00		4-6 weeks
				6F		15.7 / 0.62	171.41	9.30	6.20	1182.00	2033.00			
				12F		15.7 / 0.62	173.44	9.30	6.20	1182.00	2033.00			
		4	12	2/4/6/8/12F		XXXZDF-41W01MA1	17.2 / 0.68	229.22	10.20	6.80	1182.00	2033.00		
				24F		17.9 / 0.70	260.22	10.50	7.00	1182.00	2033.00			
		6	12	4/6/8F		XXXZDF-61W01MA1	21.3 / 0.84	272.46	12.60	8.40	1182.00	2033.00		
				12F		21.3 / 0.84	278.05	12.60	8.40	1182.00	2033.00			
		24F	12	24F		XXXZDF-M1W01MA1	22.9 / 0.90	312.65	13.50	9.00	1182.00	2033.00		
				6/12F		25.3 / 0.99	496.43	14.85	9.90	1182.00	2033.00			
		24F	24F	25.3 / 0.99		507.35	14.85	9.90	1182.00	2033.00				

4.3.4 Corning Optical Network Evolution (ONE™) Solutions Six-Module DC Power Supply Unit (PSU6)

A. Ordering Information

Part Number	Product Description
PSM-I	Power Supply Module (up to six modules per PSU6)
PSU6-1U	Power Supply Unit with no PSM-I
PSU6-1PS	Power Supply Unit with one PSM-I
PSU6-2PS	Power Supply Unit with two PSM-I modules
PSU6-3PS	Power Supply Unit with three PSM-I modules
PSU6-4PS	Power Supply Unit with four PSM-I modules
PSU6-5PS	Power Supply Unit with five PSM-I modules
PSU6-6PS	Power Supply Unit with six PSM-I modules

4.3.5 Supported NIDs

Vendor	Part Number
Tellabs™	Tellabs® 709GP ONT
Zhone®	ZNID-GPON-2624P-00
Antaira®	LMP-0601G-SFP-T

END OF SECTION



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DIVISION 28
ELECTRONIC SAFETY
AND SECURITY

SECTION 283100

FIRE SPRINKLER MONITORING AND ALARM SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This Section Includes:
 1. Provide a complete sprinkler monitoring and alarm system. The system shall be connected, tested, verified by the Authority Having Jurisdiction (AHJ) to be acceptable and left in first-class operating condition. All equipment herein specified shall be engineer-approved and California State Fire Marshal (CSFM) listed. The entire installation shall conform to the National Fire Protection Association (NFPA) Standard 72, 90A and CEC Article 760 and authorities having jurisdiction as applicable. The system specified and depicted on the plan is a complete and approved system. Substitution of system components or manufacturer will require the contractor to separately obtain approval with the CSFM at Contractor's expense and shall meet all requirements of the system as designed and pre-approved. Any routing of the system wiring that is significantly different than shown on the approved drawings shall have the approval of the engineer and must be obtained prior to construction.
 2. Provide all work and material as shown and/or required to provide a fully functional and adequate system as described herein and as required by the AHJ.
 3. Supervision: The system shall monitor the integrity of all alarm initiating and indicating appliance circuits and provide local and remote status of all connected systems. The system shall be provided with automatically charged standby batteries to maintain system operation for 24 hours in the normal supervisory mode and 5 minutes of alarm. Batteries shall be supervised for connection to the system and low voltage threshold. The automatic battery charger shall be capable of charging fully discharged system batteries to 100 percent in 8 hours.
 4. The system wiring and installation shall be as stated in drawings and as required by the manufacturer. All wiring shall be color coded, tagged and

SECTION 283100 – FIRE SPRINKLER MONITORING AND ALARM SYSTEM

- verified to assure that it is free from shorts and grounds and shall be rated for the appropriate environmental conditions such as well locations.
5. Testing: The completed system shall be tested in accordance with NFPA 72-7-1.
 6. Warranty: The equipment and wiring shall be warranted to be free from electrical and mechanical defects for a period of 2 years commencing with final acceptance by Owner.
 7. All wiring shown in drawings shall be installed in conduit.
 8. System Operation shall include:
 - a. Separate zone signaling and device status indication for all initiating devices.
 - b. Audible to sound the California uniform fire alarm signal in temporal mode. Devices shall be at least 15 dBA above average ambient sound level, but not less than 75 dBA at 10 feet or more than 120dBA.
 - c. Supervision of all circuits to indicate any abnormal wiring condition.
 - d. One NO/NC integral relay for external device interface or as indicated on drawings.
 - e. Central station connection capable of indicating three distinct separate signals as being tamper, trouble and alarm with point reporting capabilities.
 9. All work shall be completed as shown on the plans and or as specified within this specification and shall include the following (but is not limited to):
 - a. Furnishing and installation of equipment and devices.
 - b. Conductors, connections and interconnections where specified and all in conduit system.
 - c. Testing, cleaning and adjusting of completed work.
 - d. Wiring diagrams, as-built drawings and three sets of equipment operations and maintenance instructions for Owner.
 - e. All work and material for complete and operable systems as indicated or specified.
 - f. Permits, inspections and fees.
 - g. Identification and instruction to Owner Representative.
 - h. Coordination with Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 - i. Furnishing of special back boxes where required for installation of devices.
 10. Mechanical system duct detectors shall interface with fire alarm system without additional or special control devices.
 11. All conductors to be installed in conduit pursuant to Specification Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 12. Qualifications: Contractor shall receive written approval and verified test results which shall be submitted to the Owner for system from manufacturers recognized representative prior to completion and acceptance.

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13. All initiating devices shall be separately addressed for individual identification at control panel.
14. As-Built Drawings: A complete set of reproducible “as-built” drawings showing installed wiring, color coding, wire tag notations exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
15. Maintenance Instructions: Three submittals of maintenance instructions shall be provided and shall be complete, easy to read, understandable and shall provide the following information:
 - a. Instructions for replacing any components of the system, including internal parts.
 - b. Instructions for periodic cleaning and adjustments of equipment with a schedule of these functions.
 - c. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
 - d. User operating instructions shall be prominently displayed on a separate sheet located next to the control unit in accordance with UL 864. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for two years from the date of final acceptance.

1.03 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. The submittal shall include certification from the manufacturer verifying that the distributor is an authorized agent, who is qualified and trained by the manufacturer in the proper installation, operation and service of the system.
- C. Shop Drawings:
 1. A complete list of all supplied equipment including model numbers with catalog data sheets on each component and CSFM number.
 2. Provide schematic layout, floor plan, drawings indicating location of all components and equipment, required size and location of conduit and outlets and type and quantity of system conductors. Include voltage drop calculations and battery calculations based on actual number of devices to be installed.
 3. Include wiring diagrams for overall system and components including control panels, annunciators, power supplies, initiating circuits, notification appliances, control devices and FATC. Address numbers shall be noted on all appliances.
 4. Include physical and electrical characteristics of equipment to indicate conformance with the Specifications.

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5. Describe system characteristics and function as well as device wiring diagrams.
 6. Voltage drop and battery calculations for each control panel and power supply and initiating circuits.
 7. System operational matrix.
- D. Manufacturer shall provide certification that the equipment supplied under this Section has been reviewed and certified for special seismic certification include seismic companion anchorage requirements from the testing and as approved by the manufacturer. The manufacturer shall provide an approved label on the equipment enclosure stating that the equipment has been awarded a certificate of compliance for special seismic certification.
- F. Data Sheets: Show California State Fire Marshal Listing, UL-listing, equipment ratings, dimensions and finishes.
- G. Manufacturer's Certificate: Note whether the system meets or exceeds specified requirements.
- H. Operating and Maintenance Instruction Manual:
1. Manual shall include the following tailored to this specific project:
 - a. Operational description.
 - b. Coded cabling plan.
 - c. Two wire circuit diagrams.
 - d. Wiring destination schedule.
 - e. Schematic component diagrams and PC board layouts.
 - f. Maintenance and alignment procedures.
 - g. Voltage drop and battery calculations.

1.04 COORDINATION

- A. Refer to the electrical and mechanical drawings and specifications to determine quantities and location of devices and required scope of work and coordinate work with mechanical and electrical installers. Provide function described under mechanical section Sequence of Control, for fire and/or emergency conditions. Submit proposed interconnection to elevator supplier. Submit conduit and pathing requirements to electrical installer. For self-contained door release, coordinate with door supplier.

1.05 SYSTEM DESCRIPTION

- A. General: System to be listed by Underwriters Laboratories and the California State Fire Marshal, designed to meet the functional requirements of NFPA 72A, 72B, and 72D.

SECTION 283100 – FIRE SPRINKLER MONITORING AND ALARM SYSTEM

1.06 SYSTEM OPERATION

- A. Wiring, equipment and devices for alarm initiation, annunciation, and audible signaling to be continuously supervised for opens, shorts or grounds (trouble). Each alarm initiating device circuit to be provided with illuminated and audible annunciation of both trouble and alarm conditions. Non-illumination indicates a normal condition.
- B. Any alarm or trouble condition shall sound an audible signal at the panel and the remote annunciator. Signal shall be silenced by a momentary contact switch which shall transfer the signal to a visual indicator. Subsequent trouble conditions shall cause the signal to resound and in turn may be silenced. Upon restoration to normal, the trouble signal silencing indicator shall extinguish automatically.
- C. Activation of any automatic or manual alarm initiating device shall cause the following to occur (where applicable):
 - 1. Sound an audible alarm and illuminate the visual indicator for zone and type of alarm at the fire command center, the remote annunciator and fire alarm control panel.
 - 2. Sound, at building of origin, the audible alarm signal over the system audible device(s).
 - 3. Transmit signal to release the electromagnetic hold open devices on corridor doors.
 - 4. Transmit signal to close smoke dampers.
 - 5. Transmit alarm signal to energy management system for shutdown of building air handler.
 - 6. Transmit alarm signal to the central station office.
 - 7. Release exit door locks.
- D. System shall not incorporate a time delay for any of the alarm initiating devices. All alarms shall be considered confirmed alarms.
- E. Detection shall be addressable and reporting of fire conditions to be accomplished by the following basic methods:
 - 1. Manual stations.
 - 2. Smoke detectors.
 - 3. Heat detectors.
 - 4. Duct detectors.
 - 5. Waterflow switches.
 - 6. Beam detectors.
- F. Alarm system inputs to be further subdivided as follows, for a more defined indication of the location and nature of the fire or trouble condition:
 - 1. Manual station by device and location.
 - 2. Smoke/heat detector by device and location.
 - 3. Waterflow or pressure switch by device and location.

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- 4. Sprinkler valve position indication by device and location.
- G. Alarm condition shall override trouble indication. Trouble indication shall reappear after alarm reset.

1.07 LOADS OF EQUIPMENT AND COMPONENTS

- A. Follow IEEE Standards where applicable.
- B. Provide fuse protection for equipment and spare fuses.
- C. Design systems for operation at 120 volts, normal or emergency power as indicated, 60 Hz nominal input.
- D. Operating voltage dissipated by resistors shall not exceed 25 percent of ratings.
- E. Operating voltage of capacitors shall not exceed 80 percent of rated voltage.
- F. Operating loads and voltages on transistors and solid-state devices shall not exceed manufacturer's recommendation for normal full load operation.
- G. Use electronic components of types and rating commonly available from stock of established commercial distribution.

1.08 GUARANTEE

- A. Conform to applicable provisions of Division 01, GENERAL REQUIREMENTS.
- B. Service technicians and replacement components for the system shall be available locally from a service representative of the manufacturer who is able to provide evidence of technical training and authorization by the manufacturer.
- C. For a period of 2 years from date of final acceptance, the system shall be under full guarantee for materials and labor at no cost to the District. The system shall be under a service contract with a technician authorized by the manufacturer. Replacement parts and labor shall be readily available during normal business hours while the service contract is in effect. A complete system inspection and test shall be performed at five months and again at eleven months after final acceptance. Tests shall include all smoke detector sensitivity settings.
- D. All component failures shall be remedied to the satisfaction of the Owner.
- E. A continuing service contract shall be offered at time of bid to commence at the expiration of warranty included with the system.

SECTION 283100 – FIRE SPRINKLER MONITORING AND ALARM SYSTEM

PART 2 - PRODUCT

2.01 MATERIALS

- A. Alarm Panel and system shall be UL listed for power-limited application, (as described on the plans). System shall be as manufactured by Fire-Lite or approved alternate.

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with all applicable paragraphs in Section 260500, COMMON WORK RESULTS FOR ELECTRICAL, apply as though repeated herein.
- B. Install system(s) in accordance with manufacturer's instructions.
- C. Include services of certified technicians to supervise installation, provide adjustments, provide final connections, system testing and system training to Owner Representative.

3.02 GROUNDING

- A. All equipment to be grounded by means of green ground wire to "U" contact of duplex receptacles and bonded to ground provided under Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

3.03 INSPECTION

- A. Systems to meet all the requirements of the CSFM and IOR and AHJ and shall be approved thereby before installation and prior to final acceptance.

3.04 LOCATION

- A. Before installation, verify exact location of control equipment and outlets. The Owner reserves the right to relocate system components within a radius of 20 feet at no increase in cost before rough-in work is started for the respective component.

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3.05 WIRING

- A. Furnish all conductors, equipment, terminal strips, etc. and labor to install a complete and operable system. All cable conductors shall be color coded and numbered for identification at all terminals. Green shall be for grounding conductor only. Use red insulation and or red jacketing on all fire alarm cable.

3.06 TESTING

- A. After all equipment specified herein for each system has been installed and is in operating condition, conduct performance tests to determine if the installation and components comply with these specifications. Furnish competent personnel, all test material and approved test instruments and conduct the tests under supervision of factory personnel, in the presence of the Engineer, the building and fire inspecting agencies.
 - 1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
 - 2. At least one half of all tests shall be performed on battery standby power.
 - 3. Where application of heat would destroy any detector, it may be manually activated.
 - 4. The signaling line circuits and notification appliance circuits shall be opened in at least two locations to verify the presence of supervision.
 - 5. When the testing has been completed to the satisfaction of the Owner's representative a letter attesting to the satisfactory completion of said testing shall be forwarded to the owner and the authority having jurisdiction.
 - 6. The contractor shall leave the alarm system in proper working order, and, without additional expense to the Owner, shall replace any defective materials or equipment provided by him under this contract within two years from the date of final acceptance by the awarding authority.
 - 7. The local responding fire department must be notified prior to the final test in accordance with local requirements and when requested, participate in system testing and evaluation.

3.07 REPORT

- A. Prepare written report of final test results, signed by witnessing parties. Submit to the Engineer in triplicate for final approval.

END OF SECTION

**DIVISIONS 29 – 30
NOT USED**

DIVISION 31
EARTHWORK

SECTION 310000

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. This section includes:
 - 1. Earthwork, consisting of furnishing transportation, labor, materials, and equipment for performing earthwork, including but not limited to, clearing of debris; excavation, scarification, grading, filling, and compacting of earth to the grades and elevations shown on Drawings; placing imported fill; and removal of excess earth from the site.

1.03 RELATED SECTIONS

- A. Section 024113, SELECTIVE DEMOLITION.
- B. Section 033000, CAST-IN-PLACE CONCRETE.
- C. Section 312333, TRENCHING AND BACKFILLING.
- D. Section 320001, BASIC SITE MATERIALS AND METHODS.
- E. Section 321101, BASE COURSE.

1.04 REFERENCED STANDARDS

- A. Standard Specifications for Public Works Construction (RS):
 - 1. Subsection 300-2, Unclassified Excavation.
 - 2. Subsection 300-3, Structure Excavation and Backfill.
 - 3. Subsection 300-4, Unclassified Fill.
 - 4. Subsection 300-5, Borrow Excavation.
 - 5. Subsection 301-1, Subgrade Preparation.
 - 6. Subsection 306-1, Open Trench Operations

SECTION 310000 – EARTHWORK

1.05 QUALITY ASSURANCE

- A. The City representative reserves the right to approve materials to be used in construction. Do not use material which, after approval, becomes unfit for use.
- B. Refer to Section 320001, BASIC SITE MATERIALS AND METHODS, for City representative's sampling procedures for the material to be compacted.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Imported fill, where required, shall conform to Section 320001, BASIC SITE MATERIALS AND METHODS, and RS Subsection 300-5, except for 300-5.4.
- B. Excavated materials may be re-used for fill, including backfill of voids left after removals, in conformance with RS Subsection 300-4 exclusive of Subsection 300-4.9. Material shall not contain vegetation or other organics, rocks, broken concrete, debris, or other solid materials larger than 4 inches, or any other deleterious material.

PART 3 - EXECUTION

3.01 GENERAL

- A. Prior to construction, the site shall be cleared of existing slabs and foundations, vegetation, trash, and debris, which shall be disposed of off-site. Unsuitable materials at the site shall be completely removed. Efforts shall be made to locate any existing or abandoned utility lines in the area. Existing utility conduits shall be removed and/or rerouted if they interfere with the proposed construction, and the resulting cavities shall be properly backfilled and compacted.

3.02 EXCAVATION

- A. All existing fill within the building areas shall be removed and replaced with properly compacted fill. The depth of over-excavation of fill materials shall be at least 3 feet below the bearing grade of the foundation and 2 feet below slab-on-grade within the building area. The lateral extent of the over-excavation shall be a minimum of 3 feet beyond the footprint of the buildings or the depth of the over excavation whichever is greater.
- B. Excavation, including disposal of surplus material, shall conform to RS Subsections 300-2 and 300-3 exclusive of Subsections 300-2.9 and 3003.6.

SECTION 310000 – EARTHWORK

3.03 SUBGRADE PREPARATION

- A. Subgrade soils surfaces, including all excavation or removal bottoms, shall be observed by a representative of the geotechnical engineer prior to placement of fill or construction of improvements to verify that suitable soil is exposed. The exposed subgrade shall be scarified to a depth of 6 inches, moisture-conditioned to 2 percent above optimum-moisture content and compacted to a minimum of 90 percent of the American Society for Testing and Materials (ASTM) Test Method D1557 laboratory maximum density.
- B. Subgrade preparation shall conform to RS Subsection 301-1 with the exception of compaction and payment requirements.

3.04 FILL

- A. The on-site soils, free of organic materials, debris, and oversize materials (greater than 3 inches in largest dimension), are suitable to be used as general fill. Import soils shall be evaluated and tested by the geotechnical consultant before delivery to the site. Fill material shall be low in expansion potential with an Expansion Index less than 20, non-organic and free of debris or other deleterious materials. All fill soil shall be placed in thin, loose lifts less than 8 inches thick, moisture-conditioned as necessary to approximately 2 percent above optimum moisture content, and compacted using appropriate equipment to the minimum standard as noted below:
 - 1. Fill soil shall be moisture-conditioned and recompact to a minimum of 90 percent relative compaction as determined by ASTM Test Method D1557.
 - 2. Aggregate base shall be compacted to a minimum 95 percent relative compaction.
- B. Fill placement shall conform to RS Subsections 300-4, and 300-5, except for 300-5.4.

3.05 COMPACTION

- A. Perform compaction in conformance with Section 320001, BASIC SITE MATERIALS AND METHODS.

3.06 CONCRETE FLATWORK

- A. Building Floor Slabs: For living and office areas, a minimum slab thickness of 5 inches is required. For floors supporting fire trucks, a minimum slab thickness of 8 inches is required. Slabs for fire trucks shall be underlain by a minimum of 2 inches of sand, membrane, and 4 inches of 3/4-inch crushed rock. The structural engineer shall design the slab and determine the required thickness

SECTION 310000 – EARTHWORK

and reinforcement based on structural load requirements. The floor slab shall be supported by a minimum of 2 feet of compacted fill. In areas where moisture-sensitive floor coverings are planned, a vapor barrier is required. The vapor barrier shall be sandwiched between 2-inch-thick layers of clean medium-grained sand, vapor barrier, and 4 inches of 3/4-inch crushed rock. It shall be noted that the vapor barrier will retard but not eliminate moisture vapor migration through the slab. "Breathable" floor coverings shall be considered if the vapor migration rates are high.

- B. Concrete Flatwork: Subgrade preparation for concrete flatwork shall be performed as described in this specification for incidental structures. The exposed subgrade shall be scarified to a depth of at least 6 inches, moisture-conditioned to approximately 2 percentage points above optimum moisture and compacted to 90 percent of the ASTM Test Method D1557 laboratory maximum density prior to concrete placement.

3.07 GEOTECHNICALLY UNSUITABLE SOILS

- A. Notify City representative upon encountering what appear to be geotechnically unsuitable soils. Upon excavating to design subgrade elevations, obtain City representative's decision on soils suitability and authorization to excavate geotechnically unsuitable materials to limits determined by the City representative and in conformance with the "Excavation" Article of this Section. Unsuitable soils shall become the property of Contractor. Dispose of unsuitable soils off of City property.
 - 1. Native Soil Backfill: Maintain stockpile of native excavation soils approved by the City representative for use as fill or backfill in conformance with RS Subsection 300-2.6 until subgrade excavation is complete and the extent of geotechnically unsuitable soil is known. Backfill geotechnically unsuitable soil removal excavations with approved fill material. Compact in conformance with Section 320001, BASIC SITE MATERIALS AND METHODS.
 - 2. Crushed Miscellaneous Base (CMB) Backfill: Furnish, place, spread, and compact CMB in conformance with Section 321101, BASE COURSE, with compaction conforming to RS Subsection 306-1.3.2 in confined locations. Work shall conform to City of Long Beach Department of Building and Safety permit requirements where CMB is used as subgrade stabilization beneath foundations.

3.08 FIELD QUALITY CONTROL

- A. Refer to Section 320001, BASIC SITE MATERIALS AND METHODS, "Field Quality Control" Article, for City representative's determination of maximum dry density and optimum moisture content, and for field-testing of compacted soils.

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Removal of vegetation, grass, grass roots, shrubs, tree stumps, trees, upturned stumps, weed growth, tree roots, brush, masonry, concrete, rubbish, debris, and other materials.
 - 2. Removal of concrete and bituminous surfaces.
 - 3. Removal of existing fences and gates.

- B. Related Requirements:
 - 1. Division 01, GENERAL REQUIREMENTS.
 - 2. Section 312316, EXCAVATION, FILL, PAVING.
 - 3. Section 321101, BASE COURSE.
 - 4. Section 323119, FENCES, GATES, AND MOTORIZED OPERATORS.
 - 5. Section 329000, LANDSCAPE PLANTING.

1.02 SUBMITTALS

- A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.03 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition, as a minimum requirement.

PART 2 - PRODUCTS – (Not Used)

PART 3 - EXECUTION

3.01 TREE AND STUMP REMOVAL

- A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.

SECTION 31 0 0 – SITE CLEARING

- B. Fill and compact excavation from tree and stump removal. Fill in 6-inch layers, each compacted to 90 percent of maximum density in accordance with ASTM D1557.
 - 1. Back filling shall not commence until the excavation is inspected and tested.
- C. Protect in place existing trees to remain.

3.02 CONCRETE AND BITUMINOUS SURFACING REMOVAL

- A. Break up and completely remove existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to indicated limits. Cutting shall be performed to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1-1/2-inch, unless otherwise indicated. Remove concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match existing.

3.03 FENCING

- A. Existing fences scheduled to remain may be removed to facilitate the Work, provided they are installed to their original condition.
- B. Fencing indicated to be removed and not reinstalled shall be completely removed, including footings. Fill and compact excavations.
- C. Install fencing indicated to be relocated or reset in accordance with applicable requirements specified in the City standard plans.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 312313
EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
1. Excavating, filling, backfilling, and compacting for Project site pavement, planting areas, buildings, and other structures.
 2. Trenches for utility lines such as water, gas, irrigation, storm drain and sewer lines, concrete-encased conduits, manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes, and other utility appurtenances.
- B. Related requirements:
1. Division 01, GENERAL REQUIREMENTS.
 2. Section 014000, QUALITY REQUIREMENTS.
 3. Section 311000, SITE CLEARING.
 4. Section 321101, BASE COURSE.
 5. Section 321313, SITE CONCRETE WORK.
 6. Section 323119, FENCES, GATES, AND MOTORIZED OPERATORS
 7. Section 328400, LANDSCAPE IRRIGATION.
 8. Section 329200, LANDSCAPE PLANTING.
 9. Section 331001, WATER DISTRIBUTION.
 10. Section 333000, SITE SANITARY SEWER UTILITIES
 11. Section 334000, STORM DRAIN UTILITIES.
 12. Division 22, PLUMBING.
 13. Division 26, ELECTRICAL.

1.02 PROJECT REQUIREMENTS

- A. Import and Export of Earth Materials:
1. Fees: Pay as required by authorities having jurisdiction over the area.
 2. Bonds: Post as required by authorities having jurisdiction over the area.
 3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 SUBMITTALS

- A. Shoring calculations as required in Article 3.03 of this Section.

SECTION 312313 – EXCAVATION AND FILL

1.04 QUALITY ASSURANCE

- A. Comply with the Standard Specifications for Public Works Construction, current edition, except as modified herein.
- B. Sampling, testing, and certification of imported and exported soils shall be performed in accordance with Section 014000, QUALITY REQUIREMENTS.

1.05 TESTING

- A. City will retain a Geotechnical Engineer as a City Consultant who will provide observations, tests, inspections, and approvals identified in the Contract Documents as being responsibility of City.
- B. Imported Soils: The Geotechnical Engineer will review initial product Sample for testing in accordance Article 3.05 of this Section.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIALS

- A. Fill and backfill material shall be a granular material previously removed from excavation or imported fill material, free of clods and stones larger than 3 inches (2-1/2 inches for utility trenches), foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.
- B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended and aerated to stabilize and upgrade the material.
- C. Bedding material from trench bottom to one foot above the pipe:
 - 1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
 - 2. Sand complying with the Specifications for cement concrete aggregates.
- D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site. No such material shall be imported from outside the Project site.
- E. Infiltration Basin Rock:
 - 1. Provide permeable basin rock conforming to ASTM A57.
- F. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

SECTION 312313 – EXCAVATION AND FILL

2.02 BASE MATERIALS

- A. Concrete Slabs on Grade: Provide "Crushed Miscellaneous Base" as specified in Standard Specifications for Public Works Construction, Section 200 – Rock Materials, with 3/4-inch maximum size aggregates. Provide 3-inch-thick base, unless noted otherwise.
- B. Bituminous Surfacing: Provide as indicated on Drawings and specified in Section 321101, BASE COURSE.

PART 3 - EXECUTION

3.01 GENERAL

- A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48 hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the City. For on-site utilities, retain a state-licensed third-party underground utility locating service.
- B. Remove concrete or bituminous pavement to straight lines by saw cutting.

3.02 PROTECTION

- A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, OSHA regulations.
- B. Protect existing improvements including landscaping against damage. Repair or replace damaged items.
- C. Protect existing utility services and distribution systems from damage or displacement.
- D. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of two feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.
- E. Shore, crib, or lag excavations and earthen banks as necessary to prevent cave in, erosion or gullyng of sides.
- F. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed earth and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

SECTION 312313 – EXCAVATION AND FILL

3.03 SHORING

- A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives, and stairs against movement and collapse.
- B. Design and Calculations: Provide in accordance with requirement of governing Cal-OSHA requirements.
- C. Remove shoring upon completion of the Work of this Section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCAVATION

- A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300, Earthwork, except as modified herein.
- B. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other required Work.
- C. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.
- D. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.
- E. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link fence as specified in Section 01 50 00 – Temporary Facilities Controls, and in accord with Cal-OSHA standards and requirements.
- F. Trenches over 5 feet in depth shall comply with the Construction Safety Orders of the California Division of Industrial Safety.
- G. Where indicated or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.
- H. For Structures:
 - 1. Calculate excavation quantities based on elevations or depths indicated on Drawings.
 - 2. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.

SECTION 312313 – EXCAVATION AND FILL

I. For Utilities:

1. Excavate trenches to required depth for utility lines, such as pipes, conduits, and tanks, with minimum allowance of 6 inches at the bottom and 6 inches at the sides for bedding or concrete encasement as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before placing sand bedding or concrete encasement.
2. Do not install piping lengthwise under concrete walks without review by the Engineer.
3. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches above bottom of footings.
 - a. Unless otherwise indicated on Drawings, depth of excavations outside buildings shall provide for a minimum coverage above top of piping, tank or conduit measured from the lowest adjoining finished grade, as follows:

Steel Pipe	24 inches below finish grade
Copper Water Tube	18 inches below finish grade
Cast-Iron, Pressure Pipe	36 inches below finished grade
Plastic Pipe (other than waste)	30 inches below finished grade
Tanks or other structure	36 inches below finished grade
Soil, sewer, and storm drain	minimum 18 inches below finished grade, and as required for proper pitch and traffic load. Install polypropylene sewer pipe with at least 24 inches of coverage.
Irrigation Pipe:	Non-pressure pipe – 12 inches, pressure pipe – 24 inches.
 - b. Trench width shall provide space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.
4. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements.
5. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits placed in the same trench or outside surfaces of containers and tanks.

3.05 IMPORT/EXPORT OF MATERIALS

- A. A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300, Earthwork, except as modified herein. Install and compact fill in layers not to exceed 6 inches in thickness.

SECTION 312313 – EXCAVATION AND FILL

- B. Provide fill materials as specified in PART 2. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.
- C. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 014000, QUALITY REQUIREMENTS.
- D. Imported fill materials shall be sampled by the Geotechnical Engineer, for compliance with the requirements of PART 2 of this Section.
- E. The Geotechnical Engineer will submit the samples to an independent City approved testing laboratory for testing.
- F. Initial sampling and testing shall be performed before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and entity responsible for the source site. The Geotechnical Engineer will obtain both the initial and additional samples from the identified site and submit samples for required testing.
- G. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
- H. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, Engineer, City, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, California Building Code, and the City. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer will submit a verified report to the City as required by the CBC.
- I. Bills of lading or equivalent documentation will be submitted to the Engineer on a daily basis.
- J. Upon completion of import operations, provide the City a certification statement attesting that imported material has been obtained from the identified source site.

SECTION 312313 – EXCAVATION AND FILL

3.06 INSTALLATION OF MATERIALS

- A. Pavement: Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the Geotechnical Engineer, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but not more than 1 in 20. Provide adequate drainage at all times during installation of the Work of this Section.
- B. Structures:
1. After concrete has been placed, forms removed, and concrete Work inspected, backfill excavations with earth to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris and other waste materials from excavations before placing backfill.
 2. Before placing backfill, adequately cure concrete and provide bracing, if required to stabilize structure. Protect waterproofing or damp-proofing against damage during backfilling operations, with required protection board. Remove bracing as backfill operation progresses.
 3. Do not furnish or install expansive soils for retaining wall backfill.
 4. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.
- C. Utilities:
1. Do not install backfill until the Work of this Section has been inspected and tested. Do not furnish or install materials excavated from the Project site containing materials not permitted for backfill.
 2. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the City.
 3. Install backfill in layers not exceeding 4 inches in thickness, except cement-sand slurry.
 4. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grades plus one inch.

3.07 COMPACTING

- A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated, and directed compaction equipment.

SECTION 312313 – EXCAVATION AND FILL

- B. Install and compact sand bedding to provide a uniform bearing under the full length of piping and conduits.
- C. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least ninety percent.
- D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

- A. The Geotechnical Engineer will inspect and test excavations, sample material quality for testing as set required in PART 2 and observe installation and compaction of fill materials.
- B. The Geotechnical Engineer will sample imported fill materials from their designated source and submit samples to the independent approved testing laboratory before delivery to the Project site.
- C. Installation of backfill shall be observed by the Geotechnical Engineer.
- D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and other materials.
- E. Compaction: Test compaction in accordance with ASTM D1557, Method C.
- F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place, and before first placement of concrete.

3.09 PROTECTION

- A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 312333

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Trenching and backfilling consisting of furnishing transportation, labor, materials, and equipment for trench excavation and backfill operations.
 - 2. The trench excavation and backfill work includes sawcutting, asphalt concrete and concrete pavement removals, excavation, slurry backfill, and trench resurfacing with concrete and asphalt concrete.

1.02 RELATED SECTIONS

- A. Division 26, ELECTRICAL, Sections.
- B. Section 310000, EARTHWORK.
- C. Section 320001, BASIC SITE MATERIALS AND METHODS.
- D. Section 321101, BASE COURSE.
- E. Section 321216, ASPHALT CONCRETE PAVEMENT.
- F. Section 333000, SITE SANITARY SEWER UTILITIES.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C535, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- B. Standard Specifications for Public Works Construction (RS):
 - 1. Section 200, Rock Materials.

SECTION 312333 – TRENCHING AND BACKFILLING

2. Section 201, Concrete, Mortar, and Related Materials.
3. Section 306, Underground Conduit Construction.

C. Standard Plans:

1. City of Long Beach Department of Public Works.
2. City of Long Beach Water Department Standards.

1.04 QUALITY ASSURANCE

- A. The City representative reserves the right to approve each of the materials to be used in construction. Do not use material which, after approval, in any way becomes unfit for use.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Backfill shall consist of native material in conformance with RS Subsections 306-1.3.1 and 3061.3.2, unless noted otherwise on Drawings.
1. Imported trench backfill, where required on Drawings or in Specifications, shall conform to RS Subsection 306-1.3.7 and the requirements of the Section 320001, BASIC SITE MATERIALS AND METHODS.
 2. Sand shall conform to RS Subsection 2001.5.1.
- B. Additional trench subgrade stabilization material shall conform to RS Subsection 200-1.2 and 1 of the 2 following gradations as indicated on Drawings or as directed by the City representative:
1. RS Table 200-1.2 (A), 1-inch nominal gradation
 2. The following 2-inch nominal gradation:

Sieve Size (Inches)	Percent Passing
2-1/2	100
2	90-100
1-1/2	30-60
1	0-20
1/2	0-5

3. Gradation sample shall not exceed 30 percent loss by weight at 1,000 revolutions as performed under ASTM C535. Sample will be assumed to correspond most nearly to ASTM C535, "Gradings of Test Samples" Table, Grading 2.
- C. Contractor may elect, at its option, to use slurry as stabilization material.

SECTION 312333 – TRENCHING AND BACKFILLING

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Pavement removals shall conform to Section 320001, BASIC SITE MATERIALS AND METHODS.
- B. Excavation shall conform to RS Subsection 306-1.1 unless otherwise specified or shown on Drawings.
- C. Perform excavations for pipe laying or conduit in accordance with City of Long Beach Standard Plans unless otherwise detailed on Drawings.
- D. Perform trench excavations in conformance with Section 315001, EXCAVATION SAFETY REQUIREMENTS.
- E. Excavate to the depths shown on Drawings or as necessary for the installation. After the excavation is completed, notify the City representative for approval of excavation subgrade.
- F. Remove interfering portions of abandoned substructures and abandon remaining substructures in place in conformance with Section 320001, BASIC SITE MATERIALS AND METHODS.
- G. Positively determine the location and elevation of substructures containing hazardous or unstable substance installations prior to excavation in conformance with Section 315001, EXCAVATION SAFETY REQUIREMENTS.
- H. Maintain excavation trench wall stability during construction in conformance with Section 315001, EXCAVATION SAFETY REQUIREMENTS. Remove material that slides into the excavation.
- I. Trench excavation spoils not used as backfill shall become property of the Contractor and shall be disposed of off the property regardless of type of backfill material specified.

3.02 CHEMICALLY IMPACTED SOIL

- A. Handle unexpectedly discovered chemically impacted soils in conformance with Section 315001, EXCAVATION SAFETY REQUIREMENTS.

3.03 BACKFILL AND COMPACTION

- A. Place backfill in conformance with RS Subsections 306-1.3, except 3061.3.3, 1.3.5, and 1.3.6 unless otherwise specified or shown on Drawings.

SECTION 312333 – TRENCHING AND BACKFILLING

- B. Each layer of earthen backfill material, where required on Drawings, shall not exceed the thickness specified in RS Subsection 306-1.3. Compact in conformance with Section 320001, BASIC SITE MATERIALS AND METHODS.

3.04 TRENCH SUBGRADE STABILIZATION MATERIAL

- A. Once the bottom of trench excavation has been reached, obtain City representative's analysis of soils that appear saturated or that may be unsuitable as a support for trench bedding.
 - 1. Upon City representative's authorization, perform trench subgrade stabilization in conformance with RS Subsection 306-1.2.1, first and second paragraphs to the depth directed by the City representative except that replacement bedding material shall conform to one of the two gradations specified in PART 2 of this Section.
 - 2. Dispose of unsuitable soils off of the property.
- B. Refer to appropriate Section listed in "Related Work" Article for trench bedding requirements.

3.05 REPAIR AND RESTORATION

- A. Refer to Section 320001, BASIC SITE MATERIALS AND METHODS, for surface improvements not designated to be permanently removed but which were removed or damaged as a result of Contractor's operations.

3.06 FIELD QUALITY CONTROL

- A. Refer to Section 320001, BASIC SITE MATERIALS AND METHODS; "Field Quality Control" Article, for City representative's determination of maximum dry density and optimum moisture content, and for field-testing of compacted backfill.

END OF SECTION

SECTION 315001

EXCAVATION SAFETY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section..
- B. Section Includes:
 - 1. Excavation safety requirements, consisting of furnishing transportation, labor, materials, and equipment to perform excavations and trenching in conformance with State of California Construction Safety Orders issued by the Division of Industrial Safety during the course of excavation and trenching work.

1.02 REFERENCED STANDARDS

- A. California Code of Regulations (CCR):
 - 1. Title 8, Subchapter 4, Division of Industrial Safety, Construction Safety Orders.

1.03 SUBMITTALS

- A. Prior to excavating 5 feet or more in depth, submit to the Engineer for review detailed drawings showing the design of shoring, bracing, sloping, or other provisions for worker and property protection.
 - 1. Indicate design criteria, limits of shored areas, sequence of placement and removal, and shoring system details.

1.04 DESIGN AND CONSTRUCTION REQUIREMENTS

- A. If such plans vary from the shoring system standards established by the Construction Safety Orders for the State Division of Industrial Safety, the plans shall be prepared and signed by a California registered civil or structural engineer.

SECTION 315001 – EXCAVATION SAFETY REQUIREMENTS

- B. The use of a protective system less effective than that provided by the Construction Safety Orders will not be permitted.
- C. Contractor shall provide more extensive shoring or bracing systems than those required by the Construction Safety Orders when required by conditions shown on Drawings, or in the Specifications, or encountered in the field.
- D. Where excavation alignments are within 10 feet of existing buildings, streets, tanks, or other structures requiring shoring, shoring design shall accommodate surcharge loads imposed on the structure or a minimum equivalent of 2 feet in height of earth added to the active earth pressure in the upper 10 feet of shoring, whichever is greater.

PART 2 - PRODUCTS – Not Applicable

PART 3 - EXECUTION

3.01 PREPARATION

- A. Do not begin excavation work until shoring drawings are reviewed by the Engineer.

3.02 PROTECTION

- A. Exercise caution when excavating near flammable, high pressure, or high voltage substructures and conduits.
- B. Prior to excavating adjacent to and within 6 feet of an existing subsurface installation carrying a hazardous or unstable substance, excavate potholes in conformance with Section 62.03.1 of the Long Beach Municipal Code and positively determine the location and elevation of the subsurface installation.

END OF SECTION

DIVISION 32
EXTERIOR
IMPROVEMENTS

SECTION 320001

BASIC SITE MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Basic site materials and methods, consisting of furnishing transportation, labor, materials, and equipment to locate, protect, repair, remove, replace, and dispose of existing surface and subsurface conditions and improvements at the Project site, including existing utilities, structures, and substructures.
 - 2. This Section also covers basic materials and methods common to new site construction.

1.02 RELATED SECTIONS

- A. Section 033000, CAST-IN-PLACE CONCRETE.
- B. Section 042200, CONCRETE UNIT MASONRY.
- C. Section 321001, SITE PAVING AND SURFACING.
- D. Division 26, ELECTRICAL, Sections.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 2. ASTM D1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - 3. ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - 4. ASTM D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

SECTION 320001 – BASIC SITE MATERIALS AND METHODS

5. ASTM D2922, Standard Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. Standard Specifications for Public Works Construction (RS):

1. Section 201, Portland Cement Concrete.
2. Section 300, Earthwork.
3. Section 306, Underground Conduit Construction.

1.04 EXISTING SUBSURFACE CONDITIONS

- A. Locations of existing pipelines, utilities, and substructures shown on Drawings are approximate only.
- B. Keep existing services and facilities in operation except when the City representative permits shutdown in writing, and then only after temporary services have been provided.
- C. Refer to Section 3.01, Site Conditions, below, for additional requirements.

PART 2 - PRODUCTS

2.01 SOILS

- A. Imported material to be used for fill or backfill, where required on Drawings or in Specifications, shall consist of soils classified as SW, SM, SC, or SP in conformance with ASTM D2487. Soils shall have a minimum sand equivalent value of 20 percent in conformance with ASTM D2419.
- B. Import soil shall be free from deleterious trash, debris, and other material.

2.02 SOURCE QUALITY CONTROL – SOILS

- A. Coordinate with the Engineer for Department Testing Laboratory's test of off-site soil sources. Obtain City representative's approval of material prior to transporting to Project site.

2.03 SLURRY MATERIAL

- A. Cement-sand slurry: Class 100-E-100 in conformance with RS Subsection 201-1.1.2, Table 201-1.1.2(A).

SECTION 320001 – BASIC SITE MATERIALS AND METHODS

PART 3 - EXECUTION

3.01 VERIFICATION OF SITE CONDITIONS

- A. Notify Underground Service Alert two working days prior to commencing demolition, excavation, trenching, drilling, or similar underground work and obtain Dig Alert ticket number.
- B. Contact owners of existing lines and substructures that may interfere with work.
- C. Determine and mark locations of substructures not marked by owners. In addition to the substructures information shown on Drawings, maps and reference drawings showing record locations of substructures are available for review in the office of the City representative.
- D. Hand-dig excavations to design depths where alignments shown on Drawings occur within 5 feet radially of existing utilities. Hand-dig until the existing utility is located.

3.02 PROTECTION OF EXISTING FACILITIES

- A. Protect existing facilities adjacent to the Work to avoid damage. Repair or replace existing structures and improvements located above or below ground which are damaged or removed as a result of the Contractor's operations wherever such existing improvements are not specifically designated to be permanently removed. Structures to protect and repair include, but are not limited to, pipelines, wires, cables, electrical pullboxes, conduits, vaults, and maintenance holes. Repairs and replacements shall be made at Contractor's expense and shall be equal to existing improvements and shall match existing in finish and dimension.
 - 1. Replacement pavement shall be 1 inch greater in thickness than the existing pavement that was removed.
 - 2. Damaged pipelines:
 - a. Replace damaged pipeline section(s) up to and including the joints at the end of the damaged section(s).
 - b. Replace damaged joint materials.
- ~~B.~~ Place barricades and install warning lights around excavations.
- C. Exercise extreme caution when working in the vicinity of existing power poles and light poles designated to remain. Support Southern California Edison and other utilities' poles and guy wires as occur adjacent to excavations in conformance with the requirements of the utility owning the pole.

SECTION 320001 – BASIC SITE MATERIALS AND METHODS

3.03 BASIC PAVEMENT REMOVAL METHODS

- A. Perform asphalt concrete pavement removal in conformance with RS Subsection 300-1.3.2(a) except that, where the removal line will be a join line, the line shall be saw cut to a 3-inch minimum depth to provide a butt joint.
- B. Concrete pavement removal shall conform to RS Subsection 300-1.3.2(b) and (c), except that the saw cut shall be made to a depth of 3 inches. Assume that concrete slabs are reinforced.
 - 1. Removals within 3 feet of an isolation joint or contraction joint shall be taken out to the joint.
- C. Removal work performed beyond the lines and grades shown on Drawings, or beyond limits described in excavation and demolition submittal approved by the City representative, will be considered to be unauthorized and at the expense of the Contractor. City representative may order Contractor to restore such removals in conformance with Article 3.02, Protection of Existing Facilities, of this Section.

3.04 BASIC BACKFILL AND COMPACTION METHODS

- A. Earth soils compaction shall be 95 percent relative compaction for top 12 inches and 90 percent relative compaction below that unless indicated otherwise on Drawings or Specifications. Exceptions:
 - 1. Compaction recommendations from Project geotechnical report.
 - 2. Soils requiring 95 percent compaction throughout as required by City of Long Beach Building Code, Chapter 70 "Fills" section, as determined and directed by the City representative.
- B. Jetting and flooding is not permitted for compaction of trench backfill. Mechanical compaction of soils is required.
- C. Removal areas 5 feet by 5 feet or less and surrounded by pavement to remain in place on 3 or 4 sides shall be backfilled with cement sand slurry up to the bottom of proposed pavement.

3.05 FIELD QUALITY CONTROL

- A. The City representative will take samples of the soils to be compacted to determine the optimum moisture content and maximum dry density of the soils in conformance with ASTM D1557.
- B. The City will perform field testing of compacted soil in conformance with ASTM standards, including ASTM D2922 and ASTM D3017 (nuclear methods) or ASTM D1556 (sand-cone method). The City will perform compaction tests, one time, at no expense to Contractor. The City will perform retests required due to

SECTION 320001 – BASIC SITE MATERIALS AND METHODS

inadequate compaction at Contractor's expense. Contractor shall allow two working days in progress schedule for tests to be run and results to be furnished.

1. Make requests for testing 24 hours in advance through the City representative.

3.06 INTERFERING SUBSTRUCTURES

- A. Consult the City representative immediately for directions whenever substructures not shown on Drawings interfere with or affect Work. Contractor shall propose means and methods to the City representative to deal with the interferences. The City representative will make final decision on method of correction or protection to be used.
 1. If interfering substructures must be removed, the following shall be done before removing or cutting the substructures:
 - a. Tap the line and determine if the line contains any kind of liquid or gaseous material.
 - b. If storm drain or sewer lines are empty or filled with concrete or mud slurry, lines may be cut, removed, and capped or plugged, in conformance with RS Subsection 306-5.
 - c. Test conductors in conduits appearing to be abandoned and verify that conductors are de-energized. Remove de-energized conductors. Report energized conductors to the City representative and cease removal work until City representative authorizes work to resume.
 - d. Consult the City representative for methods of handling other substructures.
 - e. Notify the City representative to identify contents of unknown line if it is found to contain liquid or gaseous material. Remove contents and dispose in conformance with applicable regulations. Such work will be considered a Change in the Work and payment will be determined in conformance with the GENERAL CONDITIONS.
 2. Evacuated lines or remaining portions of abandoned lines shall be capped or removed as described in this Article for empty lines.

3.07 OWNERSHIP AND DISPOSAL

- A. Asphalt concrete and other bituminous pavement, concrete rubble, unreinforced concrete, rocks, concrete masonry, and reinforced concrete demolished at the site shall be the property of the contractor and shall be removed. Materials to be stockpiled shall meet the following conditions:
 1. Material may be transported to stockpile site only with prior approval of the City representative. Notify the City representative at least 24 hours prior to delivering materials to the stockpile.
 2. Break material into pieces not to exceed 4 cubic feet in volume and no greater than 1-foot in thickness. Projected area on any one face shall not

SECTION 320001 – BASIC SITE MATERIALS AND METHODS

exceed 4 square feet with the longest measurement in any direction across rubble piece no greater than 2 feet, 10 inches. Rebars in reinforced concrete rubble shall not protrude more than 3 inches beyond the face of concrete.

- a. Maximum dimensions also apply to concrete wheel stops.
 3. Place materials as directed by the City representative.
 4. Materials shall be free from residual petroleum, tars, waste, debris, soils, loose scrap metal, and any toxic, hazardous, or other foreign substances.
- B. Materials to be removed other than those shown on Drawings to remain or be salvaged, shall become the property of the Contractor and shall be disposed of in conformance with the Contractor's Solid Resources Management Plan.
1. The following materials shall become property of Contractor: Bricks, concrete-filled steel posts, heavily reinforced concrete items, such as concrete piles, concrete railroad ties, and wire-mesh-reinforced concrete.

3.08 HYDROCARBON-IMPACTED SOILS

- A. Notify City representative upon encountering hydrocarbon-impacted soils. Perform excavation in conformance with the "Excavation" Articles of the Section 310000, EARTHWORK, or Section 312333, TRENCHING AND BACKFILLING. Excavate impacted soils to the limits determined by the City representative and segregate impacted soils into stockpiles separate from non-impacted soils. Dispose of hydrocarbon-impacted soils in conformance with appropriate Local, State, and Federal regulations, and the REGULATORY REQUIREMENTS Section.

3.09 ASBESTOS CEMENT PIPE

- A. Perform saw cut, removals, beveling, boring, and other adjustments to existing asbestos cement pipe in conformance with federal, state, and local requirements governing asbestos abatement, transport, and disposal of asbestos-containing waste materials.
1. Dispose of asbestos-containing waste materials at a site conforming to National Emission Standards for Hazardous Air Pollutants (NESHAP), and state and local regulations for toxic substances.

3.10 MAINTENANCE AND REPAIR

- A. Unpaved access roads servicing the Project may become unstable during rainy weather. Maintain unpaved access roads to allow passage of Contractor as well as Department's trucks and passenger vehicles at Contractor's expense.
- B. Maintain continuity and integrity of permanent fences and temporary construction fences. Immediately replace fence sections damaged or missing

SECTION 320001 – BASIC SITE MATERIALS AND METHODS

during construction prior to close of the regular working day upon which damage occurred.

END OF SECTION

SECTION 321001
SITE PAVING AND SURFACING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

- B. Section Includes:
 - 1. Site paving and surfacing, consisting of furnishing transportation, labor, materials, and equipment to install site paving and surfacing materials including but not limited to:
 - a. Concrete Paving.
 - b. Concrete Curbs.

1.02 RELATED SECTIONS

- A. Section 033000, CAST-IN-PLACE CONCRETE.
- B. Section 055000, METAL FABRICATIONS.
- C. Section 101400, SIGNAGE.
- D. Section 320001, BASIC SITE MATERIALS AND METHODS.
- E. Section 321101, BASE COURSE.
- F. Section 321216, ASPHALT CONCRETE PAVING.

1.03 REFERENCED STANDARDS

- A. American Concrete Institute (ACI):
 - 1. ACI 301, Specifications for Structural Concrete for Buildings.
- B. Americans with Disabilities Act (ADA):
- C. American Society for Testing and Materials International (ASTM):

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1. ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 2. ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
- D. California Administrative Code (CAC), Title 24.
- E. California Code of Regulations (CCR).
- F. City of Long Beach Building Code.
- G. University of Pittsburgh Protocol (UPITT) Test for combustion product toxicity.
- H. Portland Cement Association (PCA):
1. Finishing Concrete Slabs, Exposed Aggregate, Patterns, and Colors, IS206T.
 2. Sandblasting of Concrete Surfaces, IS180T.
 3. Color and Texture in Architectural Concrete, SP021.01A.
- I. Standard Specifications for Public Works Construction (RS).

1.04 SUBMITTALS

- A. Make submittals no later than 30 calendar days after Notice to Proceed (NTP-1).
- B. Product Data. Submit complete lists of items proposed and mix design under this Section for approval by the City representative. Include manufacturer's name and address, specific trade names; catalog numbers complete with installation instructions, illustrations and descriptive literature. Clearly mark or underline proposed items in red; list sources of materials.
- C. Samples. Prior to placement, submit to the City representative, samples of the following items:
1. Concrete Paving Finishes and Color:
 - a. Three 12-inch-square samples of each concrete finish using the specified concrete mix design.
 - b. On the basis of review of the samples, the City representative may require minor modifications to be made. Resubmit samples incorporating modifications.
 - c. The approved samples shall establish the design appearance of the finishes specified.
- D. Procurement List. Use the approved list of items proposed under this Section for procurement without deviation unless otherwise authorized in writing by the City representative.

SECTION 321001 – SITE PAVING AND SURFACING

- E. Maintenance Instructions. Submit copies of manufacturer's specified maintenance practices for each type of paving and accessory as required.

1.05 QUALITY ASSURANCE

- A. Qualifications of Workers:
 - 1. All concrete work shall be done by experienced and skilled concrete workers with 3 years of experience applying sandblasted finishes under the supervision of an experienced concrete contractor.
- B. On-Site Mock-Ups: Prior to placement, provide on-site mock-ups of the following items:
 - 1. Concrete Work and Finishes:
 - a. Once samples have been approved, and prior to placement of concrete, provide an on-site 5-foot by 10-foot mock-up of each concrete finish specified, quartered with respective score, control, and expansion joints for approval by the City representative. Concrete curb shall include the 12-inch sample, and be a 3 feet minimum long mock-up, as indicated on Drawings. Concrete mock-ups shall incorporate all joints, finishes, and sealants at least 10 calendar days in advance of construction for approval by City representative.
 - b. Upon request, the City representative may require minor modifications to be made to the mock-ups. The revised mock-ups shall be provided at Contractor's expense.
 - c. Once the mock-ups have been approved by the City representative, retain approved mock-ups during construction as standard for judging completed Work.
 - d. Completely remove the mock-up(s) from the site upon completion of the Project.
- C. Regulatory Requirements:
 - 1. Sandblasting shall meet the South Coast Air Quality Management District (SCAQMD) requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the jobsite in such a manner that no damage occurs to the product.
- B. Notify the City representative seven calendar days prior to the time of delivery.
- C. Store materials and products in a dry and protected location. Protect from drying, breaking, rusting, deformation, staining, and moisture damage.
 - 1. Any cement delivered to job shall be packed in strong paper or jute bags with brand name and manufacturer's name stamped thereon. Cement

SECTION 321001 – SITE PAVING AND SURFACING

shall be stored under cover and should it become wet or show signs of caking or deterioration of any kind, it shall be immediately removed from the site. Concrete materials shall be protected from contamination.

- D. Brand of cement, stabilizing binder, source of aggregate or paving materials shall not be changed during course or work without prior written permission of the City representative.

1.07 ENVIRONMENTAL CONDITIONS

- A. Do not install paving during rain or other inclement conditions.

1.08 VERIFICATIONS OF DIMENSIONS AND QUANTITIES

- A. Verify scaled dimensions and quantities prior to start of work.
- B. Notify the City representative of discrepancies between Drawings and Specifications and actual job site conditions which would affect the execution of the installation work. Do not work in areas where discrepancies occur until instructed by the City representative.

1.09 COORDINATION

- A. Contractor shall be responsible for sequencing the placement of concrete with finishes to facilitate finishing operations and minimize disturbance of existing surfaces.
- B. Notify the City representative prior to the installation of the work in ample time, so as to allow sufficient time for coordination.

PART 2 - PRODUCTS

2.01 CONTRACTOR-FURNISHED MATERIALS

- A. Crushed Miscellaneous Base (CMB): As specified in Section 321101, "Base Course."
- B. Concrete Paving and Curbs:
 - 1. Comply with provisions of Section 033000, "Cast-In-Place Concrete," for materials not specified herein necessary to perform the work of this Section.
 - 2. Concrete Curing Compound: Lithochrome Colorwax, as manufactured by L.M. Scofield Company. Color to match concrete.

SECTION 321001 – SITE PAVING AND SURFACING

3. Concrete Sealer: As manufactured by HMK Stone Care Products, Acrylic Sealer intended for sealing exterior concrete surfaces.
4. Concrete Color and Finish:
 - a. Concrete Paving Type I: Color shall be standard gray. Finish shall be medium sandblast.
 - b. Concrete Paving Type II: Color shall be Scofield Chromix Admixture for Color-Conditioned Concrete, C-14 French Grey, applied at one (1) bag admixture per cubic yard of concrete. Finish shall be medium sandblast.

2.02 MIXES

- A. Concrete Paving and Curbs:
 1. Concrete mix shall be as specified in Section 033000, CAST-IN-PLACE CONCRETE.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Inspections. Verify that conditions are satisfactory for installation of paving and surfaces. Do not proceed with the work of this Section until unsatisfactory conditions have been corrected.
- B. Acceptance. Do not install paving prior to acceptance of area to receive such material by City representative.
- C. Special Precautions. Guard against damaging existing pavements and planting where new paving is to be installed.

3.02 CONCRETE PAVING

- A. Concrete walking surfaces and curbs shall have a coefficient of friction not less than 0.30. The coefficient of friction will be measured by California Test 342 before pavement is opened to public traffic, but not sooner than seven calendar days after concrete placement. Notify City representative of surfaces having a coefficient of friction less than 0.30. Repair or replacement of these surfaces shall be the responsibility of the Contractor.
- B. Concrete Paving Type I. Install as shown on Drawings, in conformance with Section 033000, CAST-IN-PLACE CONCRETE.
- C. Concrete Paving Type II. Install as shown on Drawings and in conformance with Section 033000, CAST-IN-PLACE CONCRETE.

SECTION 321001 – SITE PAVING AND SURFACING

3.03 CONCRETE FINISH

- A. Light Broom Finish:
 - 1. After surface water disappears and floated surface is sufficiently hardened, produce a light transverse scored texture perpendicular to the direction of traffic by drawing a broom across the surface.

- B. Preparation for Sandblasting:
 - 1. After surface water disappears and floated surface is sufficiently hardened, steel trowel and re-trowel to smooth surface. After concrete has set enough to ring trowel, re-trowel to a smooth uniform finish free from trowel marks or other blemishes.
 - 2. Provide necessary protection of adjacent improvements and landscaping from direct contact with sand particles. Any damage to adjacent improvements shall be repaired or replaced in kind.

- C. Light Sandblast Finish:
 - 1. Provide sandblasting to a light finish. Care shall be taken to provide even and consistent strokes with the air nozzle to minimize pock-marking the surface.

- D. Medium Sandblast Finish:
 - 1. Provide sandblasting to a medium finish. Care shall be taken to provide even and consistent strokes with the air nozzle to minimize pock-marking the surface.

- E. Heavy Sandblast Finish:
 - 1. Provide sandblasting to a heavy finish. Care shall be taken to provide even and consistent strokes with the air nozzle to minimize pock-marking the surface.

3.04 METAL EDGING

- A. Install metal edging as detailed on Drawings. Layout alignment in field for approval prior to installation. Layout to provide straight lines as shown on Drawings. Adjust layout until approved by City representative.

- B. Install in conformance with the manufacturer's installation instructions to provide a firm, strong and stable installation. Install top level as detailed or as coordinated in field. Adjust top of edging until approved by City representative.

3.05 CLEANING

- A. Upon completion of work, a final inspection for acceptance will be performed by the City representative.

SECTION 321001 – SITE PAVING AND SURFACING

- B. Sweep concrete sidewalks and pavements, remove rubbish, waste and debris resulting from this operation off-site or as directed by the City representative.
- C. Wash concrete paving free of stains, discoloration, dirt and other foreign material immediately prior to final acceptance.

END OF SECTION

SECTION 321101

BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

- B. Section Includes:
 - 1. Base Course, consisting of furnishing transportation, labor, materials, and equipment for the construction of the base course. The work includes, but is not limited to:
 - a. Furnishing base.
 - b. Loading, hauling, and transporting base.
 - c. Placing and compacting base.

1.02 RELATED SECTIONS

- A. Section 033000, CAST-IN-PLACE CONCRETE.
- B. Section 310000, EARTHWORK.
- C. Section 321216, ASPHALT CONCRETE PAVING.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C117, Standard Test Method for Materials Finer than Sieve in Mineral Aggregates by Washing.
 - 2. ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. ASTM D75, Standard Practice for Sampling Aggregates.
 - 4. Section 200, Rock Materials:
 - a. Subsection 200-1.5, Sand.
 - b. Subsection 200-2.2, Crushed Aggregate Base.
 - c. Subsection 200-2.4, Crushed Miscellaneous Base.
 - 5. Section 300, Earthwork:

SECTION 321101 – BASE COURSE

- a. Subsection 301-2, Untreated Base.

1.04 SUBMITTALS

- A. Contractor shall submit 1 cubic-foot samples of proposed base material to the City representative for approval prior to use.

1.05 QUALITY ASSURANCE

- A. Testing of base course may be performed by the Department testing laboratory. Do not place base until test results have verified compaction of the subsoil.
- B. Notify City representative when base course or portion thereof has been placed and compacted in accordance with the requirements. Do not place pavement surface until so directed by the City representative.
- C. If compaction tests indicate that base course does not meet specified requirements, remove defective work and replace. Retest costs shall be the responsibility of the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall be crushed miscellaneous base or crushed aggregate base as shown on Drawings. Materials shall compact to a hard, firm, unyielding surface and shall remain stable when saturated with water.
- B. Materials will be subject to the City representative's approval prior to use.
- C. Aggregates:
 - 1. Crushed aggregate base shall conform to Reference Specification Subsections 200-2.2 and 200-2.2.1.
 - 2. Crushed miscellaneous base shall conform to Reference Specification Subsections 200-2.4 and 200-2.4.2.
 - 3. Aggregates shall be free from silt, clay, organic matter, and other objectionable materials.
- D. Sand shall conform to Reference Specification Subsection 200-1.5.1.

SECTION 321101 – BASE COURSE

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

- A. Prior to placing of the base course, subgrade shall conform to lines, grades, cross sections, and density shown on Drawings. No base course shall be placed until the subgrade has been inspected and approved by the City representative.
- B. No base course shall be placed when the subgrade is sufficiently wet that its surface can be marred by construction equipment.
- C. The finished subgrade course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor until the base course is placed.

3.02 EQUIPMENT

- A. Submit to the City representative list of equipment to be used for placing pavement base prior to utilization on the job.
- B. Provide and maintain in operating condition equipment, tools, and machines used in the performance of the work.
- C. Contractor shall have major equipment items available for inspection by the City representative. Deficiencies in quality, quantity, or types of equipment shall be corrected prior to commencing work. This inspection and approval shall in no way relieve the Contractor from the obligation to provide the equipment required to perform the work.

3.03 TRANSPORTATION

- A. Load, transport, and deliver base materials to the job site from the source through approved haul routes.
- B. Control dust from loading and hauling operations by sprinkling with a water truck or utilize other methods acceptable to the City representative. Submit a list of equipment to be used and indicate the method of dust control.

3.04 CONSTRUCTION

- A. Place, spread, and compact of base course in accordance with Reference Specification Subsections 301-2.2 and 301-2.3. Compaction shall be 95 percent relative density. The thickness of the base courses shall be in accordance with Drawings or as instructed by the City representative.

SECTION 321101 – BASE COURSE

END OF SECTION

SECTION 321216

ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Asphalt Concrete Pavement, consisting of furnishing transportation, labor, materials, and equipment to construct asphalt concrete pavement.

1.02 RELATED WORK

- A. Section 312333, TRENCH EXCAVATION AND BACKFILL.
- B. Section 321101, BASE COURSE.
- C. Section 321723, PAVEMENT MARKINGS.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials International (ASTM):
 - 1. ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 2. ASTM C136, Standard Test method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. ASTM D1188, Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin Coated Specimens.
 - 4. ASTM D2726, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
 - 5. ASTM D2950, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
 - 6. ASTM D3381, Standard Specification for Viscosity - Graded Asphalt Cement for Use in Pavement Construction.
 - 7. ASTM D6307, Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method.

SECTION 321216 – ASPHALT CONCRETE PAVEMENT

- B. Standard Specifications for Public Works Construction (RS):
 - 1. Section 200, Rock Products.
 - 2. Section 203, Bituminous Materials:
 - a. Subsection 203-1, Paving Asphalt.
 - b. Subsection 203-2, Liquid Asphalt.
 - c. Subsection 203-3, Emulsified Asphalt.
 - d. Subsection 203-5, Emulsion-Aggregate Slurry.
 - e. Subsection 203-6, Asphalt Concrete.
 - 3. Section 302, Roadway Surfacing:
 - a. Subsection 302-5, Asphalt Concrete Pavement.
 - 4. Section 600, Modified Asphalts, Pavements, and Processes:
 - a. Subsection 600-3, Rubberized Emulsion-Aggregate Slurry.
- C. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. T312, Preparing and Determining the Density of Hot Mix A.C. by means of the Super Pave Gyrotory Compactor.
- D. City of Long Beach Standard Plans.

1.04 SUBMITTALS

- A. Copies of the supplying vendor's asphalt test report required by RS Subsection 203-1.
- B. List of equipment to be used for placing asphalt concrete prior to utilization on the job.
- C. Copies of the asphalt concrete job mix design, including gradation and binder content required by RS 203-6:
 - 1. Include coarse aggregate percentage wear test results from RS 200-1.2 and ASTM C131.
- D. Gradation sample from mixing plant.

1.05 QUALITY ASSURANCE

- A. Testing and inspection of asphalt paving mix and testing of placed asphalt concrete paving will be performed by the Department's Testing Laboratory.
- B. Contractor shall allow the City representative and Testing Laboratory personnel access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphalt concrete mix 30 calendar days prior to start of paving operations.
- C. Contractor shall have major equipment items available for inspection by the City representative. Deficiencies in quality, quantity, or types of equipment shall be

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corrected prior to commencing work. This inspection and approval shall in no way relieve the Contractor from the obligation to provide the equipment required to perform the work.

- D. Asphalt concrete pavement that the City representative determines to be out of conformance with the Specification’s gradation and compaction requirements will be subject to removal. If, after initial rejection, non-conformance continues, Contractor shall stop asphalt concrete material deliveries entirely until it can be satisfactorily demonstrated to the City representative that future deliveries will conform to Specification requirements. Contractor shall be solely responsible for any delays to the project schedule resulting from rejected asphalt concrete material.
 - 1. If compaction tests indicate that the asphalt concrete paving does not meet specified requirements, re-test costs shall be borne by Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Paving asphalt shall conform to RS Subsection 203-1.
- B. Asphalt concrete shall conform to RS Subsection 203-6, except that reclaimed asphalt pavement (RAP) shall not be used, and as specified in this Section. Composition and grading shall conform to the classes of asphalt concrete mixtures defined in RS 203-6.4.3, and W and Y as specified in this Section. Asphalt concrete class and grade shall be as designated on Drawings.
- C. Aggregates:
 - 1. Crushed slag shall not be used for coarse or fine aggregates.
 - 2. Coarse aggregates shall conform to the requirements for maximum percentage wear in 200-1.2 (B) and ASTM C131.
 - 3. The range of specific gravity of coarse aggregate shall conform to Long Beach City Department of Public Works Standards, except that payment adjustment paragraphs a, b, and c shall not apply.
 - 4. Material passing each aggregate sieve size shall be 100 percent by weight crushed rock with two (2) or more fractured faces.
 - 5. Fine aggregates shall be 100 percent by weight rock dust.
- D. Asphalt concrete for Classes W and Y shall conform to RS Subsection 203-6 and as follows:

Asphalt Concrete Mix Designs		
Sieve Size	Percentages Passing Sieves	
	Class W	Class Y
1-1/2 inches	100	100

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Asphalt Concrete Mix Designs		
Sieve Size	Percentages Passing Sieves	
	Class W	Class Y
1 inch	86-94	100
3/4 inch	74-84	87-98
1/2 inch	56-66	70-87
3/8 inch	46-56	55-76
No. 4	28-38	35-52
No. 8	18-28	22-40
No. 30	7-14	8-24
No. 50	3-10	5-18
No. 200	3-5	0-7
Asphalt Binder Percent	4.5-5	4.5-6.5
Air Voids	4.0%	4.0%

1. Production Asphalt Concrete Mix Tolerances: The “Production Asphalt Concrete Mix Tolerances” Table establishes a Job Mix Design control band which applies to Contractor’s approved Job Mix Design submittal.
 - a. Production asphalt concrete mix tolerance percentage values for each sieve may be added to or deducted from the approved Job Mix Design percentage passing values for each sieve. The resulting values still apply if they result in a job aggregate gradation control band outside of the Master Gradation Bands for Classes W and Y shown in the “Asphalt Concrete Mix Designs” Table.
 - b. Production asphalt concrete aggregate gradations, asphalt binder, and air voids shall not deviate from the approved Job Mix Design more than the tolerances shown in the “Production Asphalt Concrete Mix Tolerances” Table.
 - c. Verification will be based on daily plant extraction in accordance with ASTM D6307 Ignition Method.
 - d. Aggregate gradation will be determined in accordance with ASTM C136.

Production Asphalt Concrete Mix Tolerances				
Sieve Size	Class W		Class Y	
	Job-Mix Design Percentages Passing Sieves	Production A.C. Tolerance Range	Job-Mix Design Percentages Passing Sieves	Production A.C. Tolerance Range
1-1/2 inches	100	±0		
1 inch	86-94	±2	100	±0
3/4-inch	74-84	±4	87-98	±4
1/2-inch	56-66	±5	70-87	±5

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Production Asphalt Concrete Mix Tolerances				
Sieve Size	Class W		Class Y	
	Job-Mix Design Percentages Passing Sieves	Production A.C. Tolerance Range	Job-Mix Design Percentages Passing Sieves	Production A.C. Tolerance Range
3/8-inch	46-56	±6	55-76	±6
No. 4	28-38	±6	35-52	±6
No. 8	18-28	±5	22-40	±5
No. 30	7-14	±4	8-24	±4
No. 50	3-10	±3	5-18	±3
No. 200	3-5	±1	0-7	±1
Asphalt Binder Percent	4.5-5	±0.45	4.5-6.5	±0.45
Air Voids – Lab Samples	4.0%	-1.5 to +0.5% ¹	4.0%	-1.5 to +0.5% ¹
Air Voids – Field Samples	4.0%	-2.0 to +1.0% ²	4.0%	-2.0 to +1.0% ²

¹ The average air void volume of lab-compacted samples from a day's production shall fall between 2.5 and 4.5 percent with a standard deviation less than 0.65.

² The air void volume of each in place sample shall fall between 2.0 and 5.0 percent.

2. The "Production Tolerances" Table applies where Drawings require gradations from RS Table 203-6.4.3(A).

Production Tolerances	
Sieve Size	Tolerance Range
1-1/2 inches	± 0
1 inch	± 2
3/4-inch	± 4
1/2-inch	± 5
3/8-inch	± 6
No. 4	± 6
No. 8	± 5
No. 30	± 4
No. 50	± 3
No. 200	± 1
Asphalt Binder Percent	± 0.45
Air Voids – Lab Samples	-1.5 to ±0.5% ¹
Air Voids – Field Samples	-2.0 to ± 1.0% ²

¹ The average air void volume of lab-compacted samples from a day's production shall fall between 2.5 and 4.5 percent with a standard deviation less than 0.65.

² The air void volume of each in place sample shall fall between 2.0 and 5.0 percent.

SECTION 321216 – ASPHALT CONCRETE PAVEMENT

- E. Slurry seal shall conform to RS Subsection 203-5, except for Type I and Type II gradations in 203-5.3. Aggregate shall conform to RS Subsection 600-3.2.5, gradation conforming to 600-3.2.5(A), Fine Slurry Aggregate.
- F. Tack coat shall be in conformance with RS Subsection 203-1, either AR4000/AR8000, or SS-1 emulsified asphalt in conformance with RS Subsection 203-3.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Place crushed miscellaneous base in conformance with Section 321101, BASE COURSE.
- B. Wherever asphalt concrete paving does not terminate against a curb, gutter, or another pavement, furnish and install header at the line of termination prior to placing asphalt concrete in conformance with RS Subsection 302-5.5.
- C. Carefully lay joints between existing hard-surface pavements and new pavements; between hard-surface structures permanently embedded in the grade and new pavements; or between successive days' work in such a manner as to ensure a continuous bond between existing and new sections.
 - 1. Expose, clean, and cut edges of existing pavement or new asphalt concrete placed in the previous days asphalt concrete in place to straight, vertical surfaces.
 - 2. Lay joints between same-day successive runs adjacent to new asphalt in conformance with RS Subsection 302-5.7.
- D. At joint locations described in Paragraph E, or areas to be overlaid, apply tack coat to the existing surfaces to be joined in conformance with RS Subsection 302-5.4 prior to placing asphalt concrete.
- E. Do not place asphalt concrete until the City representative approves batch plant gradation samples.
- F. Do not place asphalt concrete until the crushed miscellaneous base has been approved by the City representative.

3.02 CONSTRUCTION

- A. Perform paving during daylight hours.
- B. Paving shall be continued uninterrupted and as expeditiously as possible once commenced.

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- C. Construct asphalt concrete paving in conformance with RS Subsection 302-5 except that Classes Y and W asphalt concrete shall be compacted to 98 percent relative density as determined in conformance with AASHTO T-312 with 75 gyrations per minute.
- D. Wherever Class W asphalt concrete is specified for the wearing surface, apply a slurry seal in conformance with RS Subsection 302-4 after paving work is complete except that application rate shall conform to 600-3.4 (A). Slurry shall conform to the “Materials” Article of this Section.
- E. Provide and maintain in good operating condition equipment, tools, and machines used in the performance of the work.

3.03 FIELD QUALITY CONTROL

- A. The City representative will determine in-place densities and other specified material properties by nuclear methods and cores. Remove and replace materials not complying with specified material property requirements.
- B. Flood Test:
 - 1. Flood asphalt pavement with water to check for positive drainage.
 - 2. Provide materials and equipment for flood testing.
 - 3. Perform test in the City representative's presence.

END OF SECTION

SECTION 321313
SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Portland Cement concrete pavement, driveways, curbs, gutters and mowing strips.
2. Ramps and stairs on grade.
3. Footings for fencing and gates, bollards, flagpoles, light standards, BBQ and charging stations.
4. Pipe encasements, thrust blocks, and equipment pads.
5. Retaining walls and planter walls.

B. Related Requirements:

1. Division 01, GENERAL REQUIREMENTS.
2. Section 031000, CONCRETE FORMWORK.
3. Section 032000, REINFORCING STEEL.
4. Section 033000, CAST-IN-PLACE CONCRETE.
5. Section 055000, METAL FABRICATIONS.
6. Section 079200, JOINT SEALANTS.
7. Section 107500, FLAGPOLES.
8. Division 23, HVAC.
9. Division 26, ELECTRICAL.
10. Section 312316, EXCAVATION AND FILL.
11. Section 321101, BASE COURSE.
12. Section 321216, ASPHALT CONCRETE PAVEMENT.
13. Section 321723, PAVEMENT MARKINGS.
14. Section 323119, FENCES, GATES AND MOTORIZED OPERATORS.
15. Section 331001, WATER DISTRIBUTION.
16. Section 333000, SITE SANITARY SEWER UTILITIES.
17. Section 334000, STORM DRAIN UTILITIES.

1.02 REFERENCES

A. Structural work, such as retaining walls, planter walls, cast-in-place benches, equipment, fence and flagpole footings, and equipment pads, conform to the following Sections:

1. Section 031000, CONCRETE FORMWORK.
2. Section 032000, REINFORCING STEEL.
3. Section 033000, CAST-IN-PLACE CONCRETE.

SECTION 321313 – SITE CONCRETE WORK

- B. Flatwork, such as walkways, driveways, ramps and steps on grade, swales, curbs, mow strips and utility related concrete, conform to:
 - 1. Standard Specifications for Public Works Construction, RS, except reclaimed aggregates and processed miscellaneous base are not allowed.
- C. Imported or exported earthwork shall conform to Section 014000, QUALITY REQUIREMENTS.
- D. National Ready Mixed Concrete Association (NRMCA):
 - 1. Checklist for the Concrete Pre-Construction Conference.

1.03 QUALITY ASSURANCE

- A. Source Limitations for Exposed Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure material required for the duration of the project as needed to ensure consistent quality in appearance.
- B. Pre-Installation Conference:
 - 1. CONTRACTOR shall coordinate and conduct pre-installation conference in conformance to Section 013100, PROJECT MANAGEMENT AND COORDINATION.
 - 2. CONTRACTOR shall use the NRMCA “Checklist for the Concrete Pre-Construction Conference” as the meeting agenda.
- C. Mockup:
 - 1. Build 8 feet by 8 feet mockups of full-thickness sections of concrete paving using processes and techniques intended for use on permanent work, including curing procedures.
 - 2. Build mockups to demonstrate typical joints; surface finishes and standard of workmanship.
 - 3. Obtain Engineer’s approval of mockup before proceeding with work of this Section.
 - 4. Mockup shall remain through completion of the work for use as a quality standard for finished work.
 - 5. Remove mockup when directed by the Engineer.
- D. Field applied primers, paintings, sealers, sealants, caulking, leveling and patching compounds, crack/joint repair compounds adhesives and similar products shall be approved by the Engineer.

SECTION 321313 – SITE CONCRETE WORK

1.04 SUBMITTALS

- A. Structural Work: Conform to the applicable requirements of Sections 031000, CONCRETE FORMWORK, 032000, REINFORCING STEEL, and 033000, CAST-IN-PLACE CONCRETE.
- B. Flatwork: Submit mix design in conformance to the RS.
- C. Shop Drawings: Submit drawings indicating the locations of concrete joints, including construction joints, expansion joints, isolation joints, and contraction joints.
- D. Submit concrete sample of each specified color.
- E. Submit full range of manufacturer's standard and custom range colors and products for Architect's review and selection.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store cement and aggregate materials so to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.
- B. Packaged materials shall bear the manufacturers and brand name label and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.
- C. Avoid exposure of reinforcing steel bars, wire, and wire fabric to dirt, moisture, or conditions harmful to reinforcing.
- D. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated by size and shape.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Work: Conform to the applicable requirements of the following Sections, except as otherwise specified:
 - 1. Section 031000, CONCRETE FORMWORK.
 - 2. Section 032000, REINFORCING STEEL.
 - 3. Section 033000, CAST-IN-PLACE CONCRETE.
 - 4. Section 079200, JOINT SEALANTS.

SECTION 321313 – SITE CONCRETE WORK

- B. Flatwork: Conform to the applicable requirements of the RS, Section 201.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that gradients and elevations of base are correct. Maintain subgrade clean and in a smooth, compacted condition until the concrete is placed.
- B. Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. Earth surface shall be kept moist by frequent sprinkling up to the time of placing concrete.

3.02 CONSTRUCTION OF FORMS

- A. Flatwork Forming: Set forms to the indicated alignment, grade, and dimensions. Hold forms rigidly in place by a minimum of four stakes per form placed at intervals not to exceed 2 feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms.
- B. Wall Formwork: Forms shall be constructed to conform to final concrete shape, lines, and dimensions of members required by Drawings and Specifications. Forms shall be sufficiently tight to prevent leakage of concrete and properly braced or tied together to maintain position and shape.

3.03 STEEL REINFORCEMENT INSTALLATION

- A. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted.
- B. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- C. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces, and lace splices with wire.
- D. Clean reinforcement of loose rust and mill scale, earth, or bond-reducing materials.

SECTION 321313 – SITE CONCRETE WORK

3.04 PREPARATION FOR CONCRETE PLACEMENT

- A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.
- B. Do not place concrete until forms, reinforcement, pipe, conduits, outlet boxes, anchors, sleeves, bolts, and other embedded materials are securely fastened in place. Maintain a minimum of 2 inches clearance between said items and any part of the concrete reinforcement.
- C. Adjust pull boxes, meter boxes, valve covers, and manholes to proposed finish grade prior to placement of concrete. Anchor bolts shall be accurately set and maintained in position by templates while being embedded in concrete.
- D. Clean thoroughly the surfaces of metalwork to be in contact with concrete, remove dirt, grease, loose scale and rust, grout, mortar, and other foreign substances before the concrete is placed.
- E. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

3.05 CONCRETE PLACEMENT

- A. Place, compact, screed, float, and trowel concrete as indicated in Section 033000, CAST-IN-PLACE CONCRETE.
- B. Finish: After straight edging, when most of the water sheen has disappeared and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.
 - 1. Provide medium broom finish on surfaces up to 6 percent slope by striating surface 1/32- to 3/64-inch-deep with a soft bristle broom across concrete surface to provide a uniform fine line texture.
 - 2. Provide heavy broom finish on surfaces over 6 percent by striating surface 1/16-inch to 1/8-inch-deep with a stiff-bristled broom.

3.06 JOINTS

- A. Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. Align curb, gutter, and sidewalk joints.

SECTION 321313 – SITE CONCRETE WORK

- B. Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated on the Drawings.
 - 2. Provide tie bars at sides of paving strips where indicated on the Drawings
 - 3. Butt Joints: Use bonding agent or epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated on the Drawings.
- D. Expansion Joints:
 - 1. Provide premolded joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together. Extend expansion joint fillers full-width and depth of joint, and 1/4-inch below finished surface where joint filler is indicated. If no joint sealer is indicated place top of premolded joint filler flush with top of concrete or curb.
 - 2. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints to a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Remove grooving-tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- F. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Remove edging-tool marks on concrete surfaces.

SECTION 321313 – SITE CONCRETE WORK

- G. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. The hardened surface shall be cleaned of latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

3.07 STAIRS AND RAMPS

- A. Install support post sleeves into the perimeter concrete curbing during the installation process of the curbing. Sleeves shall be 3-inch diameter, schedule 40 PVC with a cap solvent welded to the bottom of the sleeve. Drill a 1/2- inch weep hole on the bottom of the cap. Sleeve and cap shall be Nibco products or approved equal. Sleeves shall be embedded into concrete a minimum of 9 inches and spaced at a maximum of 4 feet, or as indicated on the Drawings. Fill sleeve with non-shrink grout Quickcrete #1585-01 when setting posts. Provide control joints into the concrete on both sides for each post.
- B. Finish step nosings with a safety step edger/groover with a 1/2-inch radius and four grooves spaced equally 3/4-inch on center and a bit depth between 1/4- to 3/8-inch. Paint with contrasting color.

3.08 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

- A. Formed Curb and Gutter: Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Finish curve shaped gutters with a standard curb mule or concrete slip formed curb paving equipment.
- B. Concrete Finishing: Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2-inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter to grade with a wood float.
- C. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 1/4-inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4-inch.

SECTION 321313 – SITE CONCRETE WORK

3.09 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.10 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 321713
PRECAST CONCRETE PARKING BUMPERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Precast concrete parking bumpers.
 - 2. Parking bumper anchors.

- B. Related Requirements:
 - 1. Division 01, GENERAL REQUIREMENTS.
 - 2. Section 033000, CAST-IN-PLACE CONCRETE.
 - 3. Section 321216, ASPHALT CONCRETE PAVEMENT
 - 4. Section 321313, SITE CONCRETE WORK.

1.02 SUBMITTALS

- A. Shop Drawings: Submit plans of the parking areas showing the location of the bumpers and installation details.

- B. Product Data: Submit manufacturers' product data for precast bumpers and bumper anchors.

- C. Material Sample: Submit one concrete bumper and one anchor.

1.03 QUALITY ASSURANCE

- A. Precast parking bumpers shall be manufactured for the intended purpose by a company or firm specializing in the manufacture of precast concrete parking appurtenances.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Precast Concrete parking Bumper: 28-day minimum compressive strength of 3,500 psi, reinforced with two No. 4 steel reinforcing bars, minimum. Provide chamfered corners, drainage slots on underside and predrilled holes for dowel-anchoring to substrate.

SECTION 321713 – PRECAST CONCRETE PARKING BUMPERS

1. Configuration: Half octagonal.
 2. Minimum Size: 7-1/2 inches wide by 5 inches high by 70 inches long.
- B. Bumper Anchors: #6 reinforcing bar, 18 inches long, two per bumper.
- C. Adhesive and Sealant: As recommended by bumper manufacturer and approved by the City.
1. Epoxy adhesive for fastening bumpers to concrete or asphalt pavements.
 2. Adhesive for Bonding Dowel to Wheel Stop.
 3. Sealant for capping off and sealing the rebar at the predrilled holes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install bumpers as indicated on the Drawings. On bituminous paving, install anchors through pavement and into the ground a minimum of 12 inches. On concrete pavement, install bumpers in a continuous bed of adhesive.
- B. Fill predrilled anchoring holes with sealant, at both concrete and asphalt pavements.

3.02 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 321723
PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

- B. Section Includes:
 - 1. Pavement markings, consisting of furnishing transportation, labor, materials, and equipment to layout and install markings, striping, lettering, and informational and directional markings on pavement and curbs; and installing pavement markers. Work further consists of covering or removing existing markings on pavements and curbs prior to installing new markings.

1.02 RELATED SECTIONS

- A. Section 321001, SITE PAVING AND SURFACING.

- B. Section 321216, ASPHALT CONCRETE PAVEMENT.

1.03 REFERENCED STANDARDS

- A. Standard Specifications for Public Works Construction (RS):
 - 1. Section 210, Paint and Protective Coatings.
 - 2. Section 214, Pavement Markers.
 - 3. Section 310, Painting.
 - 4. Section 312, Pavement Marker Placement and Removal.

- B. California Department of Transportation (Caltrans) Standard Specifications:
 - 1. Section 84, Traffic Stripes and Pavement Markings.

1.04 SUBMITTALS

- A. Submit the following prior to purchasing material:
 - 1. Equipment to be used for pavement markings.

SECTION 321723 – PAVEMENT MARKINGS

2. Complete list of materials to be used, including reflective media.
3. Materials test reports and certifications in conformance with RS Subsection 210-1.7.
4. For marker quantity less than 10000, Contractor may submit manufacturer's certification that markers and adhesive conform to RS Section 214.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Paint:
 1. Conform to RS Subsection 210-1.6.3, Rapid Dry White, Yellow, or Black for traffic paint.
 2. Blue pavement striping and markings shall conform to the requirements for white paint.
 3. Conform to RS Subsection 210-1.6.2 for thermoplastic paint.
- B. Reflective Material:
 1. Conform to RS Subsection 210-1.6.5.
- C. Pavement Markers:
 1. Conform to RS Section 214. Type of marker and adhesive shown on Drawings.

PART 3 - EXECUTION

3.01 LAYOUT OF MARKINGS

- A. Perform survey required for layout in conformance with the Section 017300, EXECUTION, using coordinate data shown on Drawings.
- B. Layout the markings at the locations and to the dimensions indicated on Drawings.
- C. Apply letters, numerals, and symbols using stencils and templates.

3.02 EQUIPMENT

- A. Equipment shall conform to RS Subsection 310-5.6.3.

SECTION 321723 – PAVEMENT MARKINGS

3.03 PREPARATION

- A. Clean and prepare pavement surfaces in conformance with RS Subsection 310-5.6.6:
 - 1. Unless otherwise specified on Drawings, remove existing markings on new and existing pavements by wet sandblasting.
- B. The City representative will inspect surfaces to be painted after Contractor has laid out pavement markings, and prior to application of paint materials. Correct deficiencies in layout and surface preparation prior to application of paint.
- C. Protect existing, adjacent facilities from overspray and spillage.

3.04 WEATHER LIMITATION

- A. Perform painting only when the atmospheric temperature is above 40 deg F, and the weather is not excessively windy, dusty, foggy, or humid. Verify suitability of the weather with the City representative in the field.

3.05 APPLICATION

- A. Mix paint in conformance with the manufacturer's written instructions. Apply the minimum thickness called for in RS Subsection 310-5.6.5.
- B. Apply paint in conformance with RS Subsection 310-5.6.8.
 - 1. Exception: Paint shall not be applied to slurry-sealed or seal coated surfaces sooner than 5 days after the slurry or seal coat has been placed.
- C. Paint may be applied to new asphalt concrete surfaces 48 hours after placement.
- D. Remove and reapply paint that bleeds, curls, or discolors.
- E. Apply thermoplastic paint in conformance with RS Subsection 210-1.6.2 and Caltrans Standard Specification Subsection 84-2.04.
- F. Install pavement markers in conformance with RS Section 312.

3.06 TOLERANCES

- A. Width of stripes shall not vary more than 1/4-inch, plus or minus, from the width shown on Drawings. The alignment and straightness of stripes shall not deviate more than 1/2-inch in 50 feet. Deviations in excess of the tolerances specified shall be erased by wet sandblasting, and the painting reapplied.

SECTION 321723 – PAVEMENT MARKINGS

3.07 CLEANUP

- A. Remove paint overspray, drips, and spills from adjacent surfaces by means which will not damage the surfaces.

END OF SECTION

SECTION 323119

FENCES, GATES, AND MOTORIZED OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Design/Build work including Delegated Design for custom galvanized steel gates as shown on the Drawings and as follows:
2. Motorized horizontal-rolling vehicular access gate at Long Beach Boulevard including galvanized steel rollers and guide track, automatic operators and remote controls. Contractor to install electrical service and connections per Division 26, Electrical, Sections for a complete system.
3. Motorized box frame cantilever slide gate with operator, controls, and chain-link at alley.
4. Manually operated swing service gates for trash enclosure and pedestrian access.
5. Power to manually operated gate with proximity card controls. Gate hardware per Section 087110, DOOR HARDWARE.
6. Steel framed fencing with decorative perforated panels.
7. Steel material standards, components, finishes, and fabrication methods for custom steel gates shall comply with Section 055000, METAL FABRICATIONS.
8. Gates and fences shall incorporate decorative perforated panels as specified.

B. Related Sections:

1. Section 033000, CAST-IN-PLACE CONCRETE, for concrete bases for gate operators and controls and post concrete fill.
2. Section 042200, CONCRETE UNIT MASONRY, for CMU walls to support site gates.
3. Section 055000, METAL FABRICATIONS, for v-track and gate frames.
4. Section 087100, DOOR HARDWARE, for locking devices for site gates.
5. Section 099113, EXTERIOR PAINTING, for finish painting of fences, gates and gate frames.

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6. Division 26, Electrical, Sections for electrical service and connections for motor operators, controls, limit and disconnect switches, and safety features and for system disconnect switches.
7. Section 312333, TRENCHING AND BACKFILLING, for excavation and backfill where decorative metal gates are located.

1.3 REFERENCE STANDARDS

- A. American Welding Society (AWS):
 1. AWS D1.1-04, Structural Welding Code – Steel.
- B. American Society for Testing and Materials International (ASTM):
 1. ASTM A29-04, Specification for Steel Bars, Carbon and Alloy, Hot-Wrought
 2. ASTM A36-05, Specification for Carbon Structural Steel.
 3. ASTM A-04, Specification for Ferritic Malleable Iron Castings.
 4. ASTM A48-03, Specification for Gray Iron Castings.
 5. ASTM A123-02, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 6. ASTM A153-04, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 7. ASTM A500-03a, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 8. ASTM A510-03, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
 9. ASTM A653-04a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 10. ASTM A780-01, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 11. ASTM A792-03, Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 12. ASTM C387-04, Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 13. ASTM C1107-02, Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
 14. ASTM F2408-04, Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.
- C. Code of Federal Regulations (CFR):
 1. 40 CFR 59, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
- D. National Electrical Manufacturers Association (NEMA):
 1. NEMA ICS 6-01, Industrial Control and Systems: Enclosures.

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- E. The Society for Protective Coatings (SSPC):
 - 1. SSPC-PA 1-04, Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel.
 - 2. SSPC-SP 5/NACE No. 1-04, Joint Surface Preparation Standard SSPC-SP 5/NACE No. 1: White Metal Blast Cleaning.
 - 3. SSPC-SP 6/NACE No. 3-04, Joint Surface Preparation Standard SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning.

- F. Underwriters Laboratories Inc. (UL):
 - 1. UL 325-01, Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
 - 2. UL 467-96, Safety Grounding and Bonding Equipment.

- G. CANTILEVERED BOX GATE PERFORMANCE REQUIREMENTS
 - 1. Completed sliding gate shall be capable of supporting a 600-lb load (applied at midspan) without permanent deformation.
 - 2. Final Gate weight must be less than 7,000 lbs.
 - 3. Delegated Design: Design custom steel gates and angle frames incorporating chainlink screening, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - 4. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 5. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 6. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- H. SLIDING GATE PERFORMANCE REQUIREMENTS
 - 1. Delegated Design: Design custom steel gates and angle frames incorporating metal screening, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - 2. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 3. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 4. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

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1.4 SUBMITTALS

- A. General: Submit in conformance with Section 013300, SUBMITTAL PROCEDURES.
- B. LEED Submittals:
 - 1. Product Data for Credits EA1, MR 3.1, MR 3.2, MR 4.1, MR 4.2, MR 5.1, MR 5.2, EQ 4.1, EQ 4.2, and EQ 7.1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Show fabrication and installation details for custom metal gates:
 - 1. Include plans, elevations, sections, and details of metal gates, fabrications, and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
 - 5. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Welding certificates.
- E. Qualification Data: For professional engineer.
- F. Maintenance Data: For gate operators to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. UL Standard: Provide gate operators that comply with UL 325.

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- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.
- F. Preinstallation Conference: Conduct conference at Project site.

1.6 WARRANTY

- A. Products shall include a factory warranty that equipment is free from defects in design, material, manufacturing and operation. Factory warranty period shall be for 5 years parts and workmanship from the date of installation.
- B. Warranty:
 - 1. The truck assembly shall be warranted against manufacturing defects by the manufacturer for a period of 5 years from date of substantial completion.
- C. Installing contractor shall guarantee the equipment, wire, and installation for 12 months from date of acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.
 - 3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
 - 4. The burden of proof of equality of proposed products is on the Contractor.
- B. Acceptable Manufacturers:
 - 1. Products named or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
 - 2. If “No Substitutions” is indicated next to the product name, provide only products of listed manufacturers.

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3. Subject to the requirements of Section 016000, PRODUCT REQUIREMENTS, products of manufacturers not listed may be proposed for substitution, provided that they are comparable to the products specified.
4. The burden of proof of equality of proposed products is on the Contractor.

2.2 GATE ACCESS CONTROL MOUNT AND ACCESSORIES (At Alley Entrance)

- A. Manufacturer
 1. Talk-A-Phone, LLC WWW.TALKAPHONE.COM
 2. No Substitution or Equal allowed.
- B. Model: Dual Height Car and Truck Pedestal
 1. ETP-GP-SMCR-L Series Gooseneck Pedestal with Hooded Surface and Light, Stainless Steel.
 2. Each level to include:
 - a. IP Call Station with Camera – VOIP 220-C-3AX-Wav1
 - b. Panel, pathway and wiring for Owner provided Card Reader. Card reader to be OFCI.
 3. Lower Lever to also include Knox box unit attached to adjacent unit. Knox box to be OFCI.
- C. Ground mount style to include mounting plate and mounting plate cover.

2.3 CUSTOM FABRICATED SLIDING STEEL GATES AND PEDESTRIAN GATES:

1. Motorized horizontal-rolling vehicular access gates and manually operated swing service gates custom fabricated as detailed on the Drawings of galvanized steel in accordance with material standards, finishes, and basic fabrication methods specified in Section 055000, METAL FABRICATIONS, including the following:
 2. Gates and fences shall incorporate infill panels.
 3. Wheels for Rolling Vehicular Gates: Elite Power Wheel (4-inch diameter) heavy duty weight capacity of 4,000 lbs. Solid-steel V-groove wheels for V-groove slide gates with gold zinc plating. One 0.5-inch x 3.25-inch bolt with nut included.
 4. Guide Tracks for Rolling Vehicular Gates: Continuous galvanized steel V-tracks anchored into concrete paving as detailed on the Drawings.
 5. Loop detector for exit at the sliding gate.
- B. Motorized Vehicle Gate Operators and Remote-Control Systems:
 1. Automatic Gate Operator Systems shall be as manufactured by Door King Solutions.
 - a. Horizontal Rolling Steel Gate Operators: Doorking 9150-080 1-HP Automatic Commercial Sliding Electric Openers
 - b. Compliant with UL 325 and 991. ETL listed.
 - c. Dimensions: 15 inches wide x 24 inches high x 16.5 inches deep.

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- d. Required Options:
 - 1) DC powered convenience open.
 - 2) Stainless steel chain.
 - 3) Plug-in loop detectors.
 - 4) Surge suppressors
 - 5) Provide Chain Tray Kit to fit length of gate.
 - 6) Provide dual 6-inch guide rollers.

- C. Remote Controls:
 - 1. Radio Control: Digital system consisting of code-compatible universal receiver for each gate, located where indicated, with remote antenna with coaxial cable and mounting brackets designed to operate gates.
 - 2. Provide one programmable transmitter(s) with multiple-code capability permitting validating or voiding of not less than 1,000 codes per channel configured for the following functions:
 - a. Transmitters: Single button operated, with open and close function.
 - b. Provide 20 remote transmitters to Owner for their use.

- D. Vehicle Loop Detectors:
 - 1. Systems including automatic closing timer with adjustable time delay before closing, timer cut-off switch, and loop detectors designed to either reverse gate, or hold gate open until traffic clears.
 - 2. Provide electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator.
 - 3. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location shown on Drawings, as recommended in writing by detection system manufacturer for function indicated.
 - a. Loop: Wire, in size indicated for field assembly, for pave-over installation.

- E. Vehicle Presence Detector:
 - 1. System including automatic closing timer with adjustable time delay before closing, timer cut-off switch, and presence detector designed to either reverse gate, or hold gate open until traffic clears.
 - 2. Provide detector with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of a vehicle in gate pathway when infrared beam in zone pattern is interrupted, and to emit a signal activating the gate operator.

- F. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensor(s). Activation of sensor(s) causes operator to immediately function as follows:
 - 1. Action: Reverse gate in both opening and closing cycles and hold until clear of obstruction.

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2. Sensor Edge: Contact-pressure-sensitive safety edge, profile, and sensitivity designed for type of gate and component indicated, in locations as follows. Connect to control circuit using gate edge transmitter and operator receiver system.
 - a. Along entire gate leaf trailing edge.
 - b. Across entire gate leaf bottom edge.
 - c. Along entire length of gate posts.
 3. Photoelectric/Infrared Sensor System: Designed to detect an obstruction in gate's path when infrared beam in the zone pattern is interrupted.
- G. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop gate at fully retracted and fully extended positions.
- H. Emergency Release Mechanism:
1. Quick-disconnect release of operator drive system of the following type of mechanism, permitting manual operation if operator fails.
 2. Design system so control circuit power is disconnected during manual operation.
 3. Type: Integral fail-safe release, allowing gate to be pushed open without mechanical devices, keys, cranks, or special knowledge.
- I. Operating Features:
1. Digital Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features with capability for monitoring and auditing gate activity.
 2. Provide units that are isolated from voltage spikes and surges, and lightning protection.
 3. System Integration: With controlling circuit board capable of accepting any type of input from external devices.
 4. Master/Slave Capability: Control stations designed and wired for gate pair operation.
 5. Automatic Closing Timer: With adjustable time delay before closing and timer cut-off switch.
 6. Open Override Circuit: Designed to override closing commands.
 7. Reversal Time Delay: Designed to protect gate system from shock load on reversal in both directions.
 8. Maximum Run Timer: Designed to prevent damage to gate system by shutting down system if normal time to open gate is exceeded.
- J. Accessories: Instructional, Safety, and Warning Labels and Signs: According to UL 325.
1. Warning Module: Audio-Visual, ADA-compliant, strobe-light alarm sounding 3 to 5 seconds in advance of gate operation and continuing until gate stops moving.
 2. External electric-powered solenoid lock with delay timer allowing time for lock to release before gate operates.

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2.4 BOX FRAME CANTILEVER SLIDE GATE

- A. Cantilever slide gate manufacturers:
 - 1. The cantilever sliding gate system shall be manufactured by Tymetal Corp., 678 Wilbur Avenue, Greenwich, NY 12834, Phone: (800) 328 283.
 - 2. Or approved equal.
- B. Gate manufacturer shall certify gate is manufactured in compliance with ASTM F2200, Standard Specification for Automated Vehicular Gate Construction.
- C. Gate manufacturer shall provide independent certification as to the use of a documented Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 welding code. Upon request, Individual Certificates of Welder Qualification documenting successful completion of the requirements of the AWS D1.2 code shall also be provided.
- D. Gate and Operators:
 - 1. Fortress Box Frame Cantilever Slide Gate with TYM-HYD-40 Hydraulic Gate Operator. Dimensions as shown on the drawings.
- E. Gate Construction Details:
 - 1. The gate frames shall be fabricated from 6063-T6 aluminum alloy extrusions. If fabricated as a single horizontal piece, no splices will be required. When the gate frame is manufactured in two horizontal pieces or sections, they shall be spliced in the field (the gate frame shall be fabricated in one or multiple sections depending on size requirements or project constraints).
 - 2. The primary members (top and bottom) shall be “P” shaped in cross section with no less than 2 inches on a side and weighing not less than 1.6 lb/lf. To maintain structural integrity this top member shall be “keyed” to interlock with a “keyed” track member.
 - 3. End vertical members of the gate frame are 2 inches x 2 inches, weighing not less than 1.1 lb/lf. Interior vertical members shall alternate between 1-inch x 1-inch and 1-inch x 2 inches in cross section, weighing not less than 0.52 lb/lf and 0.82 lb/lf respectively. The 1-inch x 2-inch and 1-inch x 1-inch intermediate vertical members shall be spaced at a distance not to exceed the overall height of the box frame. The gate shall be constructed in “box” form with the width between the frames measuring 24 inches from outside to outside. Between these frames there shall be a continuous series of 1-inch x 1-inch diagonal and horizontal bracing with the diagonals welded at approximately 45 degrees to the frames.
 - 4. The semi-enclosed “keyed” track, extruded from 6005A-T61 or 6105-T5 aluminum alloy, shall weigh a minimum of 2.9 lb/lf. A track member is to be located on each side frame. When interlocked with and welded to the “keyed” primary member, it forms a composite structure with the top of the gate frame. Welds to be placed alternately along the top and side of the track at 9-inch centers with welds being a minimum of 2 inches long.

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5. All welds on the gate frame shall conform to Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 Structural Welding Code. All individual welders shall be certified to AWS D1.2 welding code.
- F. Gate Mounting:
1. The gate frame is to be supported from the track by four swivel type, self-aligning, 4-wheeled, sealed lubricant, ball-bearing truck assemblies.
 2. The bottom of each support post shall have a bracket equipped with a pair of 3-inch (76 mm) UHMW guide wheels. Wheel cover protectors shall be included with bottom guides to comply with UL325.
 3. Gap protectors shall be provided and installed, compliant with ASTM F2200.
 4. Diagonal "X" bracing of 3/16-inch or 1/4-inch diameter stainless or galvanized steel cable shall be installed throughout the entire gate frame.
 5. The gate shall be completed by installation of approved filler as specified.
 - a. Chain Link: 2-inch x 2-inch x 9-gauge aluminized steel chain link fabric shall extend the entire length of the gate (if operated gate, counterbalance must also have fabric to prevent reach through and comply with ASTM F2200, see 1.03 C.1)
 - b. Fabric shall be attached at each end of the gate frame by standard fence industry tension bars and tied at each 2-inch x 2-inch (51 mm x 51 mm) vertical member with standard fence industry ties. ASTM F2200 requires attachment method that leaves no leading or bottom edge protrusions (cannot exceed 0.5-inch).
- G. Posts:
1. Double sets of support posts shall be minimum 4 inches O.D. (102 mm) round SS40 or 4-inch x 4-inch x 3/16-inch wall square steel tubing, grade 500. Gate posts shall be galvanized.
- H. Finish:
1. Gate to be color coated with polyester powder. Color to be selected by Engineer from complete line. The gate (including track member) and all accessories shall be pretreated chemically by sand blasting or other acceptable method to ensure proper coating adherence.
- I. Box Cantilever Gate Hydraulic Gate Operator:
1. Hydraulic Gate Operator TYM-HYD-40 with controller to be supplied by Tymetal Corp. or approved equal.
 2. Operation:
 - a. Operation shall be by means of a metal rail passing between a pair of solid metal wheels with polyurethane treads. Operator motors shall be hydraulic, geroller type, and system shall not include belts, gears, pulleys, roller chains or sprockets to transfer power from operator to gate panel. The operator shall generate a minimum horizontal pull of 300 lbs without the drive wheels slipping and without distortion of supporting arms. Operator shall be capable of handling gates

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weighing up to 4,000 lbs. Gate panel velocity shall not be less than 1.0 feet per second and shall be stopped gradually to prevent shock loads to the gate and operator assembly. The “soft stop” feature of the gate operator shall be controlled by two adjustable hydraulic brake valves (one for each direction).

- b. Standard mechanical components shall include as a minimum:
 - 1) Supporting arms: Cast aluminum channel. Arms shall incorporate a fully bushed, 1-1/2-inch bronze bearing surface, acting on arm pivot pins (item 2 below).
 - 2) Arm pivot pins: 3/4-inch diameter, stainless steel, with integral tabs for ease of removal.
 - 3) Tension spring: 2-1/2-inch heavy duty, 800 lb capacity.
 - 4) Tension adjustment: Finger tightened nut, not requiring the use of tools.
 - 5) Drive release: Must instantly release tension on both drive wheels, and disengage them from contact with drive rail in a single motion, for manual operation.
 - 6) Limit switches: Fully adjustable, toggle types, with plug connection to control panel.
 - 7) Electrical enclosure: Oversized, metal, with hinged lid gasketed for protection from intrusion of foreign objects and providing ample space for the addition of accessories.
 - 8) Chassis: 1/4-inch steel base plate, and 10 Ga. sides and back welded and ground smooth.
 - 9) Cover: 16 Ga. galvanized sheet metal with a powder paint finish. All joints welded, filled and ground smooth. Finished corners square and true with no visible joints.
 - 10) Finish: Fully zinc-plated then finish coat of high gloss powder paint withstanding 1,000-hour salt spray test.
 - 11) Drive wheels: 6-inch diameter metal hub with polyurethane tread.
 - 12) Drive rail: Shall be extruded 6061 T6, not less than 1/8-inch-thick. Drive rail shall incorporate alignment pins for ease of replacement or splicing. Pins shall enable a perfect butt splice.
 - 13) Hydraulic hose: Shall be 1/4-inch synthetic, rated to 2750 psi.
 - 14) Hydraulic valves: Shall be individually replaceable cartridge type, in an integrated hydraulic manifold.
 - 15) Hose fittings: At manifold shall be quick-disconnect type, others shall be swivel-type.
 - 16) Hydraulic fluid: High performance type with a viscosity index greater than 375 and temperature range -40 deg F to 167 deg F (-40 deg C to 75 deg C).
- c. A zero to 2,000-psi pressure gauge, mounted on the manifold for diagnostics, shall be a standard component.

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- d. The hydraulic fluid reservoir shall be formed from a single piece of metal, non-welded, and shall be powder painted on the inside and the outside, to prevent fluid contamination.
- 3. Minimum standard electrical components:
 - a. Pump motor: Shall be a 1-1/2 hp minimum.
 - b. All components shall have overload protection.
 - c. Controls: Smart Touch Controller Board with 256K memory containing:
 - 1) Inherent entrapment sensor.
 - 2) Built-in “warn before operate” system.
 - 3) Built-in timer to close.
 - 4) Liquid crystal display for reporting of functions.
 - 5) 26 programmable output relay options.
 - 6) Anti-tailgate mode.
 - 7) Built-in power surge/lightning strike protection.
 - 8) Menu configuration, event logging, and system diagnostics easily accessible with a PC and HySecurity’s free START software.
 - 9) RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems or network interface.
 - 10) Provide a relay to indicate gate position.
 - 11) Transformer: 75 VA, non-jumpered taps, for all common voltages.
 - 12) Provide an output and delay timer to allow external locks to disengage before movement of gate panel.
 - 13) Provide an output for interlocking two gate operators. Provide an output for secure/unsecured indication lights.
 - 14) Provide a terminal strip for connection of external interlocks.
 - 15) Control circuit: 24VDC.
 - d. Required external sensors: Specify photo eyes or gate edges or a combination thereof to be installed such that the gate is capable of reversing in either direction upon sensing an obstruction.
 - e. Accessories: Instructional, safety, and warning labels and signs according to UL 325:
 - 1) Warning module: Audio-Visual, ADA-compliant, strobe-light alarm sounding 3 to 5 seconds in advance of gate operation and continuing until gate stops moving.
 - 2) External electric-powered solenoid lock with delay timer allowing time for lock to release before gate operates.

2.5 PEDESTRIAN GATE MATERIALS

- A. Steel material for gate panels and posts shall conform to the requirements of ASTM A653, with a minimum yield strength of 45,000 psi and a minimum zinc

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(hot-dip galvanized) coating weight of 0.90 oz/ft², Coating Designation G-90. Gates to be powder-coated in a color to be selected by engineer.

- B. Refer to drawings for sizes and shapes.
- C. Refer to Section 2.07 below for infill panels.
- D. Hardware: Refer to Door Schedule and Section 087100, DOOR HARDWARE, for gate hardware requirements. Refer to electrical drawings for door control details.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000, CAST-IN-PLACE CONCRETE, with a minimum 28-day compressive strength of 3000-psi, 3-inch slump, and 1-inch maximum aggregate size.
- C. Non-shrink Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107 and specifically recommended by manufacturer for exterior applications.
- D. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 – completely sanded joint, some undercutting and pinholes okay.
- E. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123 unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A153.
- F. Metallic-Coated Steel Finish: Shop paint in color/finish to be selected by Architect.

2.7 FENCING AND PRIVACY SCREEN MATERIAL

- A. Laser cut decorative perforated metal panels.
- B. Acceptable Supplier:
 - 1. Bok Modern Inc. San Francisco, CA 94109, Phone: (415) 749-6500, Email: info@bokmodern.com, Website: www.bokmodern.com.
 - 2. Or approved equal.
- C. Component-based, decorative perforated metal panel assemblies:
 - 1. “Blade” Posts:

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- a. 60-inch high x 1/4-inch thick blade post with 6-inch X 6-inch x 3/8-inch welded plate. SST material with Tiger Drylac 38 with primer 2-coat system. Finish to match panels.
2. Ornamental Perforated Metal Panels for pedestrian and rolling gate and privacy screens:
 - a. Fence panel: 4-bend panel – 4 feet wide x 6 feet high at perimeter fence. Other locations: size per drawings.
 - b. Perforated Aluminum Sheet: 3/16-inch TH at fence and rolling gate, 1/8-inch at all other locations.
 - c. BOK Pattern Library Style B21.
 - d. Finish: Color Anodic Finish: AAMA 611, AA-M12C22A44, MIL-A-8625F Type II, Architectural Class 1, 0.7 to 1.2 mil coating thickness.
 - e. Color: Dark Bronzed
 - f. To be used for Roof mounted mechanical equipment screens (refer to Section 055000, METAL FABRICATIONS).
3. Brackets.
4. Hardware.

2.8 CAST-IN-PLACE CONCRETE

- A. General: Comply with ACI 301 for cast-in-place concrete.
- B. Materials: Refer to Section 033000, CAST-IN-PLACE CONCRETE.

2.9 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement:
 1. Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound.
 2. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer for exterior applications.

SECTION 323119 – FENCES, GATES, AND MOTORIZED OPERATORS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes.
 - 1. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 2. Construction layout and field engineering are specified in Section 01700, EXECUTION.

3.3 GATE AND FENCE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.4 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation for Concrete Bases: Hand-excavate holes for bases, in firm, undisturbed soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated.
- C. Concrete Bases: Cast-in-place, depth not less than 12 inches, dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.

SECTION 323119 – FENCES, GATES, AND MOTORIZED OPERATORS

- D. Vehicle Loop Detector System: Cut grooves in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.
- E. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Automatic Gate Operators: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, alarms, and limit switches.
 - 1. Hydraulic Operators: Purge operating system, adjust pressure and fluid levels, and check for leaks.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls, alarms, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lubricate hardware, gate operators, and other moving parts.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates. Refer to Section 017823, OPERATION AND MAINTENANCE DATA; Section 017900, DEMONSTRATION AND TRAINING, and Section 017700, CLOSEOUT PROCEDURES.

END OF SECTION

SECTION 328400
LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work Included: Provide labor, material and equipment for the underground irrigation system including the following:
1. Trenching, stockpiling excavated materials, and refilling trenches.
 2. Complete system including but not limited to piping, valves, fittings, controllers, and wiring, other miscellaneous irrigation equipment, and final adjustments to ensure efficient coverage, as determined by Owner's Representative.
 3. Replacement of unsatisfactory materials.
 4. Clean-up, inspection, and approval.
 5. Tests.

1.02 RELATED REQUIREMENTS

- A. Division 26, ELECTRICAL, for low voltage connections to controller.

1.03 ACTION SUBMITTALS

- A. Special Requirements.
1. Work involving substantial plumbing for installation of copper piping, backflow preventer(s), and related work shall be executed by licensed and bonded plumber(s). Obtain necessary permits prior to beginning work.
 2. Tolerances: Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, recompaction, and repair of finish grade treatment.
 3. Coordination with other contracts: protect, maintain, and coordinate work with work under other sections.
 4. Damage to other improvements: contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, or planting done under other sections during work associated with installation of irrigation system at no additional cost to the Owner.
 5. Manufacturer's Specifications: Follow current printed specifications and drawings in cases where manufacturer cover items or information not specified or shown in the current documents.

SECTION 328400 – LANDSCAPE IRRIGATION

- B. Explanation of Drawings.
1. Due to the scale of the drawings, it is not possible to indicate offsets, fittings, sleeves, etc. which may be required. Carefully investigate the conditions affecting the work and plan accordingly and furnish required fittings. Install system in such a manner to avoid conflicts with planting, utilities, and architectural features.
 2. Do not install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in dimensions exist. Bring such obstructions or differences to the attention of the Landscape Architect and Owner's Representative. In the event this notification is not given, the Contractor shall assume full responsibility for necessary revisions, as determined by Landscape Architect or Owner's Representative.

1.04 SUBMITTALS

- A. Material List.
1. Complete manufacturer's technical data and installation instructions shall be submitted prior to performing any work. Material list shall include the manufacturer, model number, and description of all materials and equipment to be used.
 2. Shop Drawings: Prepare and submit the following fully dimensioned and labeled.
- B. Record Drawings.
1. Complete manufacturer's technical data and installation instructions shall be submitted prior.
 2. Drawings shall include dimensions from two permanent points of reference such as building corners, sidewalks, or road intersections for the location of the following items:
 3. Connection to existing water lines.
 4. Connection to existing electrical power and splice locations.
- C. Record Drawings.
1. The original record drawings shall be submitted to the Owner's Representative for approval prior to making the controller chart.
 2. Drawings shall include dimensions from two permanent points of reference such as building corners, sidewalks, or road intersections for the location of the following items:
 - a. Connection to existing water lines.
 - b. Connection to existing electrical power and splice locations.
 - c. Modifications to existing system.
 - d. Relocated existing equipment.
 - e. Gate valves.
 - f. Routing of mainline indicating all changes in direction and points along straight runs at intervals no more than 100 feet.

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- g. Routing of sprinkler pressure lines.
 - h. Remote control valves.
 - i. Routing of control wiring (if not with pressure mainline).
 - j. Quick coupling valves.
 - k. Note quantity and location of spare control wires.
 - l. Other related equipment as directed by the Owner's Representative.
3. Owner will not certify pay requests submitted by the Contractor if the record drawings are not current, and processing of pay request will not occur until record drawings are updated.
- D. Controller Charts.
1. Controller charts shall be prepared by Contractor after approval of record drawings by the Landscape Architect or Owner's Representative.
 2. Provide one controller chart for each controller supplied or modified.
 3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow when rolled up.
 4. The chart shall be a reduced drawing of a scale of the actual as-built system and shall be readable when reduced and shall be to a size that will fit within the controller door or in a standard size 3-ring binder or spiral bound as directed by the Owner.
 5. Scale shall be no less than 1-inch = 50 feet. Use multiple pages as required.
 6. The chart shall be a black line print and different colors shall be used to indicate the area of coverage for each station.
 7. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 mils.
 8. These charts shall be completed and approved prior to final inspection of the irrigation system.
- E. Operation and Maintenance Manuals.
1. Contractor shall prepare Operation and Maintenance Manuals in accordance as follow:
 - a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.
 - b. Catalog and parts sheets on all material and equipment installed under this contract.
 - c. Guarantee statement.
 - d. Complete operating and maintenance instructions on all major equipment.
 - e. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

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- F. Equipment to be Furnished.
 - 1. Furnish the following tools:
 - a. Two sets of special tools required for removing, disassembling, and adjusting each type of sprinkler head and valve provided on this project.
 - b. Keys for each automatic controller, as needed.
 - c. One quick coupler key and matching hose swivel for every 5 or fraction thereof of each type of quick coupling valve installed.
 - 2. This equipment shall be furnished to Owner before final inspection can occur. Evidence that the Owner has received material must be provided to Owner's Representative.

1.05 QUALITY ASSURANCE

- A. Manufacturer's directions and detailed drawings shall be followed in all cases where points are not shown in the Drawings and Specifications.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with a minimum of 5 years of experience.
- D. Supervision: A qualified and experienced superintendent must be in charge of the work of this section and must remain at the site at all times that work is in progress.
- E. Drawings are generally diagrammatic and indicative of the work to be installed and do not show all offsets, fittings, sleeves, and other parts which may be required. Contractor shall carefully investigate the structural and finished conditions affecting all work and plan accordingly, furnishing such fittings, and other appurtenances as may be required to meet such conditions. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
- F. Before commencing irrigation system installation, Contractor shall resolve obstructions, grade differences or discrepancies in area dimensions that might not have been considered in engineering and shown on the Drawings.

1.06 WARRANTY

- A. The warranty for the irrigation system shall be made in accordance with the following form.
- B. A copy of the warranty form shall be included in the operations and maintenance manual.

SECTION 328400 – LANDSCAPE IRRIGATION

- C. The warranty form shall be retyped onto the contractor's letterhead and contain the following information:

- D. Warranty for Irrigation System.
 - 1. We hereby warrant that the irrigation system we have furnished and installed is free from defects in materials and work quality, and the work has been completed in accordance with the drawings and specification. We agree to repair or replace any defects in material or work quality what may develop during the period of one year from the date of acceptance, except those that may be caused by ordinary wear and tear, unusual abuse or neglect. We also agree to repair or replace any damage resulting from the repairing or replacing of such defects a no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense, and we will pay costs and charges therefore upon demand.

 - 2. PROJECT: _____

 - 3. PHONE NUMBER: _____

 - 4. ADDRESS: _____

 - 5. BY: _____

 - 6. DATE OF ACCEPTANCE: _____

 - 7. BY: _____

1.07 COORDINATION AND SCHEDULING

- A. Observation/Materials and Installation Review Schedule. Contractor shall coordinate and notify Landscape Architect and Owner’s Representative in advance for the development of an inspection schedule for on and off-site review of materials and installation of products as needed per design.

- B. Install all piping and provisions for equipment assemblies such as risers, swing joints, and nipples when subgrade has been established but prior to spreading any on-site or imported material over subgrade.

- C. Stage installation of work in area of stock piled material as necessary.

- D. Coordinate the work with site backfilling, landscape grading and delivery of plant life.

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- E. Schedule and coordinate all required irrigation utility connections with other project trades and /or utility companies.
- F. Obtain information pertaining to location of all proposed lines and equipment prior to irrigation installation.

1.08 JOB SITE CONDITIONS

- A. Protection of Property.
 - 1. Preserve and protect trees, plants, monuments, structures, and paved areas from damage due to Work of this Section. In the event damage does occur, damage to inanimate items shall be completely repaired or replaced to satisfaction of Owner. Injury to living plants shall be repaired by Owner, and costs of such repairs shall be charged to and paid by contractor.
 - 2. Protect buildings, walks, walls, and other property from damage. Flare and barricade open ditches. Damage caused to asphalt, concrete, or other building material surfaces shall be repaired or replaced at no cost to Owner. Restore disturbed areas to original condition.
- B. Protection and Repair of Underground Lines.
 - 1. Request proper utility company to stake location of underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these underground lines from damage. In the event damage does occur, damage shall be repaired by Contractor, and costs of such repairs shall be paid by Contractor unless other arrangements have been made with Owner.
- C. Replacement of Paving and Curbs.
 - 1. Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition.
- D. The contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect. In the event this notification is not preformed, the irrigation contractor shall assume full responsibility for any revision necessary.

1.09 REGULATORY REQUIREMENTS

- A. Requirements of Regulatory Agencies: All work and materials shall be in full conformance with the latest rules and regulation of the California Plumbing and Electric Codes.

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- B. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering pints not shown in the drawings and specifications.
- C. Underwriters Laboratories: Electrical wiring, controls, motors, and devices shall be UL-listed, and so labeled.
- D. Pre-Installation Meeting:
 - 1. Convene one week prior to commencing work of this Section.
 - 2. Schedule after major components have been initially staked.

1.10 FIELD QUALITY CONTROL

- A. Observation/Materials and Installation Review Schedule. Contractor shall coordinate and notify Landscape Architect and Owner's Representative in advance for the development of an inspection schedule for on and off-site review of materials and installation of products as needed per design.

1.11 MAINTENANCE SERVICES

- A. Installer's Field Services: Prepare and start systems under provisions of Division 01, GENERAL REQUIREMENTS, Specification Sections.
- B. Maintain system during plant establishment.
- C. Instruct Owner Representative on detailed operation system.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and requirements.
- B. Coordinate with on-site storage and Owner.
- C. Handling of PVC Pipe and Fittings: Exercise care in handling, loading, unloading, storing, and installation of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle that allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping. Do not store PVC pipe in direct sunlight, cover pipe as required.

SECTION 328400 – LANDSCAPE IRRIGATION

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

- A. PVC Pressure Main Line Pipe and Fittings.
 - 1. Pressurized piping to be minimum schedule 40 PVC (2 inches and smaller) and Class 315 PVC (2-1/2 inches and larger) with Schedule 80 fittings. Circuit piping (laterals) shall be Schedule 40 PVC with Schedule 40 fittings. All piping to be solvent weld with Primer.
- B. PVC Non-Pressure Lateral Line Piping – Permanent Irrigation.
 - 1. Non-pressure buried lateral line piping shall be Schedule 40 with solvent-welded joints.
- C. PVC Sleeves:
 - 1. PVC sleeves shall be Schedule 40 with solvent weld joints. Install sleeves at 36 inches depth to top of pipe. Backfill sleeve trench with sand.

2.02 VALVES

- A. Electrical Remote-Control Valves.
 - 1. Pressure Regulating Electric Remote-Control Valves shall be manufactured by Hunter (Hunter PGV, Hunter ICV).
 - 2. Pressure regulating modules for pressure reduction (Hunter ACCU-Sync).
- B. Gate Valves.
 - 1. Furnish and supply materials that comply with industry design standards and meet requirements of the local permitting authority.
- C. Master Valves.
 - 1. Refer to Irrigation Schedule, Irrigation Plan.
- D. Flow Sensor.
 - 1. CST Flow Sensor.
 - 2. Hunter Solar Sync.
- E. Electrical Remote Control Drip Valves.
 - 1. Pressure Regulating Electric Remote-Control Valves shall be manufactured by Hunter (ICZ, ICZ XL). Refer to Irrigation Schedule on Irrigation Plan.
- F. Associated Valves.
 - 1. Y-Strainer brass 80 mesh with brass ball valve to blow-out screen.
 - 2. Above ground Y-strainers shall be metal.
 - 3. Y-strainer shall be same size as water supply.
 - 4. Ball valves 3 inches and larger shall be brass; ball valves 2 inches and smaller shall be schedule 80 PVC.

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2.03 AUTOMATIC CONTROLLER

- A. Automatic controller products and description.
 - a. Refer to Irrigation Schedule, Irrigation Plan.

2.04 SUBSURFACE / POINT SOURCE DRIP EMITTERS

- A. Shrub Planting: Refer to Irrigation Schedule, Irrigation Plan.
- B. Tree Planting: Refer to Irrigation Schedule, Irrigation Plan.

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 329000
LANDSCAPE PLANTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Scope of Work: Provide landscape planting, complete in place, as shown and specified including; removal of rock, gravel and other construction related material, sub-grade treatment, soil replacement, rough grading, soil amendment and preparation, finish grading, planting, clean-up, and maintenance.

1.02 RELATED REQUIREMENTS

- A. Section 328400, LANDSCAPE IRRIGATION.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated and as needed to construct the landscape planting design per plan, include construction details, material descriptions, dimensions of individual components and suppliers.
- B. Quality Assurance Submittals:
 - 1. Plants shall be subject to inspection and approval by the Landscape Architect at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. The health and vigor of the plant material is the sole responsibility of Contractor. Submit written request for inspection of plant material at place of growth to Landscape Architect stating location and quantity of plants to be inspected.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Deliver fertilizer to site in unopened containers bearing manufacturer's guaranteed chemical analysis.
 - 2. Furnish Owner's Representative with copies of receipts for all amendments.
 - 3. Deliver all plants with legible identification labels.
 - a. Label trees, shrubs, bundles of plants, or groundcover plants.
 - b. State correct plant name and size indicated on plant list.
 - c. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 days.

SECTION 329000 – LANDSCAPE PLANTING

4. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.
5. Notify Owner's Representative 7 days in advance of delivery of all plant materials and submit an itemized list of the plants in each delivery.
6. Ship and store mulch, and fertilizer with protection from weather or other conditions that would damage or impair the effectiveness of the product.

B. Storage:

1. Store plant material in shade and protect from weather.
2. Maintain and protect plant material not to be planted within 4 hours in a healthy, vigorous condition.

C. Handling:

1. Contractor is cautioned to exercise care in handling, loading, unloading and storing of plant materials. Plant materials that have been damaged in any way shall be discarded and shall be replaced with undamaged materials at the Contractor's expense.

1.05 COORDINATION AND SCHEDULING

- A. Perform planting only when weather and soil conditions are suitable in accordance with standards of industry.
- B. Scheduling: Install trees, shrubs before wood mulch is spread.
- C. Observation/Materials and Installation Review Schedule. Contractor shall coordinate and notify Landscape Architect and Owner's Representative in advance for the development of an inspection schedule for on and off-site review of materials and installation of products as needed per design.

1.06 SAMPLES AND TESTS

- A. Owner's Representative reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request. Rejected materials shall be immediately removed from the site at Contractor's expense. Cost of testing of materials not meeting specifications shall be paid by Contractor.
- B. Contractor shall have soil tested for soil amendments by a certified soil testing laboratory after rough grading operations are complete. Samples from multiple planting areas shall be taken and sent for laboratory testing.

SECTION 329000 – LANDSCAPE PLANTING

1.07 WARRANTY

- A. General Warranty: the special warranty specified in this article shall not deprive the Owner of other rights the Owner may have under other provisions of the contract documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the contract documents.
- B. Special Warranty: warrant the following living planting materials for the following specified time period after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions for warranty period, or incidents that are beyond the contractor's control.
 - 1. Trees - 1 year.
 - 2. Shrubs - 6 months.
 - 3. Groundcovers - Length of maintenance period.
- C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.
- D. Replace planting materials that are in a substantially unhealthy condition (more than 25 percent of the plant dead or remove due to death of branches, etc.) at end of warranty period.
- E. A limit of one replacement of each plant material will be required, except for losses or replacement due to failure to comply with requirements.

PART 2 - PRODUCTS

- 2.01 **GENERAL** Furnish and supply materials, equipment, labor, testing and miscellaneous related items to provide for construction of the landscape planting design per this contract and as necessary to connect the proposed project improvements to the existing site.

PART 3 - EXECUTION

- 3.01 **INSPECTION** Obtain Owner Representative's written acceptance that planting soils have been cleaned of all construction debris, including gravel, concrete, concrete washout, paints, asphalt, etc. Refer to preparation and planting installation paragraphs of this section.
 - B. Obtain Owner Representative's written acceptance that final grades have been established to within 1/10 foot prior to commencing planting operations. Provide

SECTION 329000 – LANDSCAPE PLANTING

for inclusion of all amendments, settling, etc. Contractor shall be responsible for shaping all planting areas as indicated on Drawings.

- C. Prior to planting, inspect trees, shrubs, and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning.
- D. Do not begin planting of trees until deficiencies are corrected or trees are replaced.

3.02 SOIL CLEANUP AND PREPARATION

- A. Clean Up: Contractor shall review site conditions and previously completed rough grading to verify that all imported stones, stumps, gravel, concrete, asphalt, and other construction debris have been cleared from the site to a depth of 24 inches, prior to continuing project work. Contractor shall remove any and all germinated weeds.
- B. Soil Cleanup, Replacement and Preparation:
 - 1. After approximate finished grades have been established, soil shall be conditioned and fertilized in the following manner. Amendments shall be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top 6 inches of soil.
 - 2. Application Rates: Per 1,000 square feet, the following organic, soil amendments and fertilizer establish minimum requirements. Specific amendments and fertilizer amounts will be determined after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Owner's Representative. The amounts listed below are considered minimum amounts for the project unless directed otherwise by the Owner's Representative.
 - a. Nitrogen stabilized organic amendment – 6 cubic yards for groundcover and shrub beds, 3 cubic yards for lawn areas. Owner's Representative may request delivery tags.
 - b. Planting fertilizer - 15 lbs.
 - c. Gypsum - 200 lbs.
 - d. Soil sulphur - 20 lbs.
 - e. Iron – 2 lbs.
 - f. Calcium carbonate – 2 lbs.
- C. Final Grades:
 - 1. All areas shall be graded so that the final grades will be 1-inch below adjacent paved areas, sidewalks, valve boxes, headers, clean-outs, drains, manholes, etc. or as indicated on Drawings.
 - 2. Surface drainage shall be away from all building foundations.
 - 3. Eliminate all erosion scars prior to commencing maintenance period.
- A. Disposal of Excess Soil: Dispose of any unacceptable or excess soil legally at an off-site location.

SECTION 329000 – LANDSCAPE PLANTING

3.03 PLANTING INSTALLATION

A. General:

1. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
2. Containers shall be opened, and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Pre-plant Weed Control:

1. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide, as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days to allow systemic kill. Clear and remove these existing weeds by mowing or grubbing off all plant parts at least 1/4-inch below the surface of the soil over the entire area to be planted.
2. After irrigation system is operational, apply water for 5 to 10 days as needed to achieve weed germination. Apply contact herbicides and wait as needed before planting. Repeat, if required by Owner's Representative.
3. Maintain site weed free until final acceptance by the Owner's Representative.

C. Layout of Major Plantings:

1. Locations for plants and outlines of areas to be planted shall be marked on the ground by Contractor before any plant pits are dug. All such locations shall be approved by the Owner's Representative. If underground construction or a utility line is encountered in the excavation of planting areas, other locations for planting may be selected by the Owner's Representative. Layout shall be accomplished with flagged grade stakes indicating plant names and specified container size on each stake.

D. Planting of Trees and Shrubs:

1. Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds.
2. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.
3. Protect all areas from excessive compaction when trucking plants or other material to the planting site.
4. All excavated holes shall have vertical sides and shall be of a size that is three times the diameter and one-and-one-half times the depth of the root ball for all trees and shrubs. After pits are dug, roughen the sides of the pit and loosen soil in the bottom of the pit to a depth of 3 inches. Construct foot-tamped mound in the bottom of the pit to support the plant at the proper level.

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5. All prepared tree pits must be reviewed and approved by the Owner's Representative prior to the planting of any trees.
6. Percolation tests are required for one out of every five trees planted on a given site. Tree pits from each planting area of the project shall be tested for percolation. However, in areas where over-excavation of a building foundation has occurred, or any other construction practice typically resulting in extremely compacted subsoil conditions, all tree pits must be tested for percolation. Tree pits shall be filled with water and the drainage rate observed. Percolation rate shall be a minimum of the depth of the tree pit within 24 hours. If percolation/drainage rate is less than that – mitigation measures shall be implemented (see Section 3.02, Soil Cleanup and Preparation, above).
7. Do not handle container plants by the tops, stems or trunks at any time. Lift all plants so that the root ball is supported from the underside. Plants that do not have a satisfactory root system will be rejected. If plants do not have young feeder roots showing at the edge of the container, loosen their roots and score the root ball with a 1/2-inch-deep vertical line to encourage new feeder root development.
8. Center plant in pit or trench. Crown of trees shall be 1-inch minimum above finish grade. Crown of shrubs shall be 1-inch above finish grade.
9. Face plants with fullest growth into prevailing wind.
10. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball or roots.
11. Backfill for trees and shrubs shall consist of amended native soil. If native soil is unsuitable or contaminated, use imported topsoil as specified above.
12. All plants which settle deeper than the surrounding grade shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately half of the height of the root ball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.
13. Container Removal:
 - a. Cut containers on two sides with a can cutter designed for the job.
 - b. Do not injure root ball.
 - c. Do not cut containers with spade or axe.
 - d. After removing plant, superficially cut edge roots with knife on three sides.
14. Box Removal:
 - a. Remove bottom of plant boxes before planting.
 - b. Remove sides of box without damage to root ball after positioning plant and partially backfilling.
15. Plant Tablets:
 - a. After the water has completely drained, planting tablets shall be placed as indicated below.
 - 1) Two tablets per 1-gallon container.
 - 2) Four tablets per 5-gallon container.
 - 3) Six tablets per 15-gallon container.

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- 4) Ten tablets per 24-inch box.
 - 5) Fourteen tablets per 36-inch box.
 - 6) Eighteen tablets per 48 inches and those box sizes which are larger.
 - b. Planting tablets shall be set with each plant on top of the root ball while the plants are still in their containers so the required number of tablets to be used in each hole can be easily verified by the Owner's Representative.
16. Backfill
- a. The remainder of the hole shall then be backfilled with two-third native soil and one-third organic amendment thoroughly blended and tamped firm.
 - b. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be of a depth sufficient to hold at least 2 inches of water. The basins shall be constructed of amended backfill materials. Remove basin in all turf areas after initial watering.
17. Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to shape the plant material as directed by the Owner's Representative. Pruning shall not be done prior to delivery of plants.
18. Staking: Staking of all trees shall be completed immediately after planting. All stakes shall be installed plumb and as indicated in drawing details.
- E. Planting of Groundcovers:
1. Groundcover plants shall be grown in gallon containers as indicated on the drawings.
 2. Groundcover shall be planted in straight rows and evenly spaced, unless otherwise noted, and at intervals called out in the Drawings. Triangular spacing shall be used unless otherwise noted on the Drawings.
 3. Each rooted plant shall be planted with its proportionate amount of container soil. Plantings shall be immediately sprinkled with water after planting until the entire area is soaked to the full depth of each hole.
 4. Care shall be exercised at all times to protect the plants after planting. Any damage to plants by trampling or other operations shall be repaired immediately.
- F. Mulch Cover:
1. All groundcover, perennial, and shrub beds shall be dressed with a 3-inch layer of mulch, where slopes are not steeper than 2:1. Mulch cover shall not be placed within 6 inches of trunk.
- G. Hardpan Conditions:
1. Where hardpan exists, whether it is in the form of caliche or other impervious clay, and it is within the top 2-1/2 feet of soil, use powered equipment to break through completely at each tree location to allow drainage and root growth. Remove hardpan at least 1-1/2 feet greater than the root ball diameter of tree. Backfill with soil mix as specified.

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2. Where hardpan is within the first 12 inches of soil, it shall be completely penetrated for all shrubs.

3.04 CLEANUP

- A. During the progress of the Work, the Contractor shall keep the Project site in a neat and clean condition that is free of debris to the satisfaction of the Owner's Representative. All materials and debris accumulated in conjunction with completing this Work shall be legally recycled or disposed of by Contractor off site. Remove all trash, excess soil, empty plant containers and rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site.
- B. The Contractor shall leave the site area broom-clean and shall wash down all walkways and other paved areas, leaving the premises in a clean and safe condition.
- C. Promptly remove soil and debris created by hydroseed work from paved areas and building walls. Clean wheels of vehicles before leaving site to avoid tracking soils onto surfaces of roads, walks, or other paved areas.

END OF SECTION

SECTION 329446
WIRE ROPE TRELLIS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Wire Rope Trellis Systems.
- B. Related Requirements:
 - 1. Section 0420000, CONCRETE MASONRY UNITS, for substrate for attaching wire rope trellis system.
 - 2. Section 329000, LANDSCAPE PLANTING, for planting installation on trellis.

1.03 ACTION SUBMITTALS

- A. General: Comply with Section 013300, SUBMITTAL PROCEDURES.
- B. Product Data: Submit for each type of product and accessories.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - 2. Include statement indicating cost for each product having recycled content.
- D. Samples: For each exposed product and for each color and texture specified.
- E. Samples for Initial Selection: For units with factory-applied finishes.
- F. Samples for Verification: For each type of exposed finish, not less than 6-inch-long linear components and 4-inch-square sheet components.

SECTION 329446 – WIRE ROPE TRELLIS

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wire rope trellis materials.

PART 2 - PRODUCTS

2.01 WIRE ROPE TRELLIS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
 - 1. Jakob “GreenKit 4” – Stainless Steel Trellis System – 80 inches x 38 inches; by Jakob Rope Systems. Five total units, 2665 NW 1st Avenue, Boca Raton, FL 33431, Phone: (561) 330-6502, Web: Jakobs USA.
 - 2. Or approved equal.
- B. Trellis System:
 - 1. Provide a complete set of cables, spacers, and accessories for the installation of the trellis. Provide 5/32-inch diameter cables and spacers fabricated from marine-grade stainless steel and UV-resistant plastic cross clamps.
 - 2. Install with manufactured provided mounting hardware.
 - 3. Finish: Stainless Steel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of wire rope trellis in accordance with landscape architects direction for planting integration.
- B. Install wire rope trellis level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

DIVISION 33
UTILITIES

SECTION 330527

DETECTION TAPE

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Detection tape, consisting of furnishing transportation, labor, materials, and equipment to furnish and install detection tape to mark the location of electrical conduits, water lines, sewer lines, storm drains, gas lines, telephone lines, and other conduits and lines.

1.02 RELATED SECTIONS

- A. Section 312333, TRENCHING AND BACKFILLING.
- B. Section 333000, SITE SANITARY SEWER UTILITIES.

1.03 REFERENCED STANDARDS

- A. American Public Works Association (APWA).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Detection tape shall be acid, alkaline, and corrosion resistant detectable marking tape "Terra Tape Sentry Line" as manufactured by Reef Industries, Incorporated, Houston, Texas, Phone (800) 231-6074 or equivalent product as manufactured by T. Christy Enterprises, Phone (800) 258-4583.
- B. Detection tape shall be 6 inches wide by 5 to 6 mils thick. The tape shall be made of one layer of metalized foil laminated between two layers of inert plastic film.

SECTION 330527 – DETECTION TAPE

- C. Tape shall bear a continuous printed message to conform to the utility within the trench the tape is being installed in. The message shall be as indicated on Drawings or as may be the standard from the manufacturer for that utility.
- D. Tape color and legend combination shall be in conformance with APWA color coding or local requirements. Color codes are as follows:
 - 1. Red: Electric power, distribution, and transmission installations or municipal electric installations.
 - 2. Yellow: Gas distribution, oil distribution, petroleum, or installations containing dangerous materials, products, or steam.
 - 3. Orange: Telephone, telegraph installations, police and fire communications installations, and cable television.
 - 4. Blue: Water installations and slurry pipelines.
 - 5. Green: Sewer and storm drain installations.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Where crushed miscellaneous base is used in the pavement structural section, install tape a minimum of 12 inches below bottom of the base material parallel and directly above the buried line unless indicated to be deeper on Drawings.
- B. Where cement-sand slurry is used as backfill directly under asphalt concrete, place tape on top of slurry material parallel to and directly above the buried line unless indicated to be deeper on Drawings.

END OF SECTION

SECTION 331001
WATER DISTRIBUTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.

- B. Section Includes:
 - 1. Water Distribution, consisting of furnishing transportation, labor, materials, and equipment to construct fire suppression water service and domestic water distribution systems.

- C. Related Sections:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE.
 - 2. Section 312333, TRENCHING AND BACKFILLING.
 - 3. Section 321216, ASPHALT CONCRETE PAVEMENT.
 - 4. Section 330527, DETECTION TAPE.

1.02 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. ANSI B16.1, Cast Iron Pipe and Flanged Fittings.
 - 2. ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM B88, Standard Specification for Seamless Copper Water Tube.

- C. American Water Works Association (AWWA):
 - 1. AWWA C104, Cement-Mortar Lining for Ductile – Iron Pipe and Fittings for Water.
 - 2. AWWA C10, Polyethylene Encasement for Ductile Iron Pipe.
 - 3. AWWA C110, Ductile-Iron and Gray-Iron Fittings, 3-inches, through 48-inch for Water and Other Liquids.
 - 4. AWWA C111, Rubber-Gaskets Joints for Ductile-Iron Pressure Pipe and Fittings.

SECTION 331001 – WATER DISTRIBUTION

5. AWWA C115, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 6. AWWA C150, Thickness Design of Ductile Iron Pipe.
 7. AWWA C151, Ductile-Iron Pipe, Centrifugally Cast, for Water.
 8. AWWA C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines-Enamel and Tape – Hot Applied.
 9. AWWA C509, Resilient-Seated Gate Valves, for Water Supply Service.
 10. AWWA C511, Reduced-Pressure Principal Backflow Prevention Assembly.
 11. AWWA C600, Installation of Ductile-Iron Water Mains and their Appurtenances.
 12. AWWA C651, Disinfecting Water Mains.
- D. Factory Mutual (FM)
- E. Standard Specifications for Public Works Construction (RS):
1. Subsection 207-9, Iron Pipe and Fittings.
 2. Subsection 306-1, Open Trench Operations.
- F. Standard Plan - City of Long Beach Department of Public Works:
1. 634 Trench Width and Bedding Requirements.
- G. City of Long Beach Water Department Standards and Specifications (WDS).
- H. Underwriters Laboratories Inc. (UL).

1.03 SUBMITTALS

- A. Submit to the Engineer the following:
1. Complete materials list including pipe, position indicators, back flow preventers, valves, valve boxes, fittings, thrust blocks, anchor devices, joints, fire hydrants, and appurtenances.
 2. Copy of the test results from the City Health Department.
 3. Copy of certified statements from the pipe and fitting manufacturers that the pipes and fittings are cement lined and have been manufactured as specified.
 4. Copy of the chlorination reports.
 5. Proposed schedule detailing the line segments to be tested, the methods of isolating the testing from the rest of the system, the schematic diagram of the system for pressurizing monitoring techniques showing the hydrostatic test pump, the safety relief valves, and any other equipment used for the test.
 6. A test report of pressure tests on piping and equipment shall be forwarded in duplicate to the Engineer. This report shall show date of test, lines tested, length of time the test pressure was held, pressure drop or rise, volume leakage, and extent of venting and re-pressuring.

SECTION 331001 – WATER DISTRIBUTION

7. As-built drawings showing the coordinates and elevations of underground tees, bends, crosses, valves, plugs, and caps.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Pipes:
 1. Store pipe in stock piles built on a flat base.
 2. Keep rubber gaskets from excessive heat and free from oil and grease.
- B. Store fittings, hydrants, and valves on wooden platforms above ground.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall be approved by City of Long Beach Department of Building and Safety, City of Long Beach Water Department, FM approved, and UL listed.

2.02 PIPING

- A. Ductile iron shall be in conformance with Reference Specification (RS) Subsection 207-9.
 1. Pipe 4 inches and larger shall be Class 52 in conformance with AWWA C151, double cement mortar lined in conformance with AWWA C104.
 2. Pipe ends shall be factory machined or, if field cut, shall be beveled as required.
 3. Flanged pipe shall be Class 53 in conformance with AWWA C115 unless otherwise called for on Drawings.
 4. Furnish pipe in plus or minus 18-foot laying lengths.
 5. Lining and coating of pipe and fittings shall be in conformance with RS Subsection 207-9.2.4.
 6. Joint for ductile iron pipes and fittings shall be in conformance with RS Subsection 207-9.2.2.
 7. Pipes shall have the letters "UL" or "FM" marking in conformance with AWWA C151, Section 51-11.
- B. Copper pipe shall be in conformance with ASTM B88.
 1. Pipes 3 inches and smaller shall be Type "K".
- C. Fittings:
 1. Fittings 3 inches and smaller shall be wrought copper or cast red bronze, close grained, and nonporous. Cast fittings permitted only in sizes and type not available in wrought fittings.

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2. Fittings 4 inches and larger shall be ductile-iron in conformance with AWWA C110, and double cement mortar lines per AWWA C104.
 - a. Mechanical joints: Class 350.
 - b. Flanged fittings shall be Class 125 with 250 psi rated pressure. Fittings shall be in conformance with AWWA C104. These flanges match those of the Class 125 flanges shown in ANSI B16.1 and can be joined with valve, hydrants or other fittings having Class 125, ANSI B16.1 flanges.
- D. Joints:
1. Underground Installation: Push on joints, unless indicated otherwise on Drawing.
 2. Above Ground Installation: Pipe fittings and joints 4-inches in diameter and larger shall be flanged in conformance with AWWA C110.
 3. Provide restraining glands at change in directions and where mechanical joints are used or as indicated on Drawings.
 4. Restraining glands for mechanical joints shall be Megalug Series 1100-DEC and Megalug Bell Restraint Harness Series 1700 for push-on joints as manufactured by EBAA, (800) 433-1716.
 5. Flange adaptor shall be Mega Flange-Flange Adapter Series 2100 with bolts, nuts, and gasket as manufactured by EBAA, Phone: (800) 433-1716.
 6. Flexible expansion joints shall be flextend double ball flanged as manufactured by EBAA.
 7. Nuts and bolts shall be coated with 3M EC244.

2.03 VALVES AND APPURTENANCES

- A. Underground valves, 6 inches to 12 inches, shall be NRS, resilient wedge valves, Model F-6100 as manufactured by Clow Valve Company. Valves shall be right hand turn in closing direction. Provide position indicator as indicated on Drawings.
- B. Valves shall be right-hand turn in closing direction.
- C. Above ground valves for fire suppression water service system shall be O.S. and Y, resilient wedge gate valves, Model F-6102 as manufactured by Clow Valve Company, Phone: (909) 340-2300.
- D. Above ground valves for domestic water system shall be NRS, flanged, resilient wedge valves, Model F-6102, as manufactured by Clow Valve Company.
- E. Backflow preventer shall conform to AWWA C506, and shall be reduced pressure type, Cla-Val Model RP-4 or approved equal.

SECTION 331001 – WATER DISTRIBUTION

- F. Valve box for valve with position indicator shall be cast iron, complete with top, extension, bottom, and drop lid with 1/2-inch skirt, Series 6855, Item 662A, as manufactured by Tyler Pipe.
- G. Valve box for fire hydrant control valve shall be cast iron valve box complete with cover, model A-3009 as manufactured by Alhambra Foundry Company, 1147 Meridian Avenue, Alhambra, CA 91802, Phone: (818) 289-4244.
- H. Fire hydrant break off spool shall be 6-inch by 6-inch, flanged, as manufactured by Long Beach Iron Works. Spool shall be delivered without bolt holes in one flange. Bolt holes shall be drilled in the field to facilitate orientation of fire hydrant outlets as indicated on Drawings.
- I. Check valves shall be swing type, bronze mounted with bronze faced disc, Kennedy Valve Figure No. 126.
- J. Fire department inlet connections shall be two-way straight (back outlet) with double clappers, 2-1/2-inch by 2-1/2-inch female hose inlets, brass pin lug swivel, cast brass body with no lettering, Potter-Roemer Figure No. 5721. Provide each inlet with brass pin lug plug with attached chain, Potter-Roemer Figure No. 5941.
- K. Water meters will be furnished by the Long Beach Water Department upon application and payment of fees to the Long Beach Water Department.

2.04 HYDRANTS

- A. Hydrants shall be 2 inches with caps and without sampling nipple as shown on WDS-109.

2.05 MISCELLANEOUS

- A. Solid plug shall be ductile iron and mechanical joint, Series 1261, manufactured by NAPPCO.
- B. Adapter shall be ductile iron, NAPPCO Series 1255.

2.06 POSITION INDICATORS

- A. Position indicators shall be GPI Series sealed gear as manufactured by Dyna-Torque Incorporated, Muskegon, Michigan, Phone: (616) 739-1377.

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2.07 CORROSION CONTROL

- A. Outside surfaces of underground pipe and fittings shall be corrosion protected with 8 mil thick polyethylene tube encasement in conformance with WDS.
- B. Paint the above ground water system in conformance with WDS, color as follows:
 - 1. Fire suppression water distribution: ICI color 7520, Engine Red.
 - 2. Domestic water distribution: ICI color 7574, OSHA Blue.
 - 3. Fire Hydrants: Yellow as required by Long Beach Water Department.
- C. Apply coal-tar enamel in conformance with WDS to underground metals not otherwise protected against corrosion.

2.08 RUBBER GASKETS

- A. Furnish rubber gaskets and gasket lubricant with rubber gasket joint pipe in sufficient quantity for the amount of pipe ordered.
- B. Rubber gaskets for flanged joints shall be full face 1/8-inch-thick neoprene rubber and in conformance with AWWA C111.

2.09 BEDDING MATERIALS

- A. Pipe bedding shall be Case A bedding in accordance with Standard Plan 634 with a Type A (sand or gravel) bedding material unless shown otherwise on Drawings.

2.10 MASONRY BLOCK SUPPORTS

- A. Masonry block supports for services shall be as detailed Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Construct water system after grading and compacting of the surrounding areas to the top of the rough grade elevation has been completed.
- B. Install in conformance with the requirements of the City of Long Beach Department of Building and Safety, City of Long Beach Fire Department, AWWA C600, and RS Subsection 306-1. The existing water system shall be maintained in service until new service has been activated, except for making connections. Coordinate any fire protection system shutdowns with the City of

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Long Beach Water Department, and the Engineer. Shut downs shall be limited to the minimal time required to complete connections to existing systems.

- C. Coordinate installation of backflow preventers with the installation of meters by the City of Long Beach Water Department.
- D. Protect excavations and trenching against caving-in by shoring or otherwise in conformance with Section 315001, EXCAVATION SAFETY REQUIREMENTS.
- E. Thrust Blocks:
 - 1. Thrust blocks, restraining, and anchorage devices at all changes in direction shall be approved by Engineer for size and detail wherever such details are not shown on Drawings.
 - 2. Perform concrete work in accordance with the details shown on Drawings or approved shop drawings and conform to the requirements of Section 033000, CAST-IN-PLACE CONCRETE.
- F. Backfilling shall be in conformance with Section 312333, TRENCHING AND BACKFILLING.
- G. Depth of Cover:
 - 1. Where no profile information is shown on Drawings, the minimum cover on pipes 16 inches in diameter or smaller shall be 4 feet measured from top of pipe to finished grade. In the event of local interference or adjustments to meet existing pipe elevations, permission maybe granted by the Engineer to drop below these elevations to avoid the obstruction.
 - 2. Realignment piping (to avoid localized interference and to meet grade of existing piping, where the resultant depth of cover in localized areas does not exceed 24 inches below the specified depth), shall be done at Contractor's expense. Deflection in piping at any one joint resulting from grade change shall not exceed recommendation of pipe manufacturer.
- H. Install detection tape as specified in Section 330527, DETECTION TAPE.
- I. Paint pursuant to WDS:
 - 1. Paint fire hydrants safety yellow.
- J. Furnish to the Engineer an accurate table of each buried valve showing manufacturer's name, model number, size, stations, elevations, and number of turns from fully opened to totally closed position.

3.02 CLEANING AND DISINFECTING

- A. Prior to installation, clean piping interior by wire brush or other means to remove scale, sand, cutting chips, and the like. Remove loose material by compressed air. After construction and prior to testing, flush piping with clean water to remove construction debris.

SECTION 331001 – WATER DISTRIBUTION

- B. Disinfect that portion of the water systems installed under this Specification, including any existing waterlines, if necessary, at either end of the system back to the first available valves. Conform to AWWA C651 for disinfecting water mains. Furnish and install and remove upon completion of testing, blind flanges, valves, pressure connections, and chlorination inlet point(s) required to test and chlorinate the water system. Contact the Water and Sewerage Section of Long Beach Health Department, Monday through Thursday to arrange for sampling and testing water in the new system.

3.03 TESTING OF WATER SYSTEM

- A. General:
 - 1. Prior to backfilling waterline trenches, test new sections of the water distribution system in conformance with RS Subsection 306-1.4 and the requirements of the City of Long Beach Plumbing Code, except that the water lines shall be hydrostatically pressure tested at 200 psig, in the presence of City of Long Beach Plumbing Inspector and the Engineer.
- B. Reduced pressure backflow devices shall not be pressure tested.
- C. Maximum allowable leakage shall be in conformance with RS Subsection 306-1.4.5.

END OF SECTION

SECTION 333000

SITE SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Sanitary sewer, consisting of furnishing transportation, labor, materials, and equipment to construct sanitary sewer system.

1.02 RELATED SECTIONS

- A. Section 310000, EARTHWORK.
- B. Section 312333, TRENCH EXCAVATION AND BACKFILL.
- C. Section 330527, DETECTION TAPE.

1.03 REFERENCED STANDARDS

- A. City of Long Beach Department of Building and Safety Codes.
- B. City of Long Beach Department of Public Works Standard Plan:
 - 1. 634 Trench Width and Bedding Requirements.
- C. City of Long Beach Water Department Plans and Specifications.
- D. Standard Specifications for Public Works Construction (RS):
 - 1. Subsection 207-8, Vitrified Clay Pipe.
 - 2. Subsection 207-9, Cast Iron and Ductile Iron Pipe.
 - 3. Subsection 306-1, Open Trench Operation (except for 306-1.3.3, and 306 1.6).

SECTION 333000 – SITE SANITARY SEWER UTILITIES

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sanitary sewer shall be cast-iron pipe in accordance with RS Subsection 207-9, vitrified clay pipe per RS Subsection 207-8 and PVC plastic pipe per RS Subsection 207-17.

2.02 BEDDING MATERIALS

- A. Bedding materials shall be in accordance with Standard Plan 634.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Trench excavation, bedding, pipe installation, backfill, densification and testing shall be in accordance Standard Plan 634, Case A bedding and Reference Specification Subsection 306-1, unless shown otherwise on Drawings.
- B. Backfill shall be compacted to 90 percent relative density except for the top 12 inches of backfill which will be compacted to 95 percent relative density to coincide with required subgrade compaction.
- C. Install detection tape as specified in Section 330527, DETECTION TAPE.

3.02 INSPECTION

- A. Inspection shall be required of installations prior to concealment and completion of work by the Long Beach Department of Building and Safety and the Engineer.

END OF SECTION

SECTION 334000
STORM DRAIN SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Storm Drainage, consisting of furnishing transportation, labor, materials, and equipment to construct storm drainage.

1.02 RELATED SECTIONS

- A. Section 033000, CAST-IN-PLACE CONCRETE.
- B. Section 312333, TRENCHING AND BACKFILLING.
- C. Section 330527, DETECTION TAPE.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM International):
 - 1. ASTM C76: Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. Standard Specifications for Public Works Construction (RS):
 - 1. Subsection 207-17, PVC Plastic Pipe.
 - 2. Subsection 207-9, Cast Iron and Ductile Iron Pipe.
 - 3. Subsection 300-3, Structure Excavation and Backfill.
 - 4. Section 306, Underground Conduit Construction.
 - 5. Subsection 306-1, Open Trench Operations.
- C. Standard Plan, City of Long Beach Department of Public Works, Bureau of Engineering:
 - 1. SP-63, Trench Width and Bedding Requirements.
 - 2. SP-636, Catch Basin Stencils.

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- D. Reference Standard Plan:
 - 1. SP-304, Grating Catch Basin.
 - 2. SP-204, Cleanout.
 - 3. SP-151, Parkway Drain.

1.04 QUALITY ASSURANCE

- A. The Testing Laboratory will perform compaction tests one time at no expense to Contractor. Retests because of failed tests will be performed by the Testing Laboratory and paid for by Contractor. Allow time for tests to be run and results returned.

1.05 SUBMITTALS

- A. One-cubic foot samples of proposed bedding materials for approval prior to use.
- B. Pipeline layout diagram in accordance with RS Subsection 207-2.1.
- C. Grade sheets by a California Licensed surveyor or registered civil engineer.
- D. Submit a material certificate for rock conforming to ASTM No. 57 for review. Reviewed and accepted samples will be returned to the Contractor. Submit material certificates for geotextile, geogrid, base course and backfill materials.
- E. Material manufacturer's certificate of compliance with the specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete: Concrete materials shall conform to the applicable requirements of Section 033000, CAST-IN-PLACE CONCRETE, and as specified in this Section. Cement shall be Type II.
- B. Bedding: Bedding shall conform with Standard Plan 634.
- C. PVC Plastic pipe shall conform with RS Subsection 207-17.
- D. Ductile iron pipe shall be in accordance with RS Subsection 207-9.
- E. Manhole shall conform with Standard Plan 200, Pre-cast Concrete Manhole.
- F. Materials
 - 1. Excavation: Shall be smooth soil, level and free of lumps or debris. Compact to at least 90 percent or as required by Engineer. Structural fill

SECTION 334000 - STORM DRAIN SYSTEM

material may be used to amend the structural capacity of the soil, and should be placed on top of the geogrid layer if needed. Materials that can be stabilized by compaction, such as sand and/or drainage rock, should be avoided

2. Geogrid: Use geogrid product, such as Tensar BX1200, or equal, to overlay the excavation floor, the assembled cells, and above the completed liner, extending at least twice the width of side backfill, with geogrid joints overlapped by at least 12 inches.
3. Geotextile: Shall be non-woven PP or PET with a weight of at least 8 oz per square yard, appropriate for the soil type and depth conditions, placed on the floor of the excavation, the sides of the chamber and chamber top.
4. Rock conforming to ASTM No 57, n=0.4, for Rock Reservoir fill.
5. Side Backfill: Structural fill free from lumps or debris or any other sharp materials to backfill along the sides of the cellular structure, taking care to compact with powered mechanical compactor, in lifts that do not exceed 12 inches, to provide a settlement-free surface over the top and sides of the structure.
6. Top Backfill: Use 12-inch minimum to 36-inch maximum depth of 3/4-inch minus sandy/gravel road base material (with fines less than 3 percent). If backfill mixture must be custom mixed, use a ratio of 2 parts clean 3/4-inch drainage rock to 1 part clean sand.
7. Utility Marker: Use metallic tape at corners of install to mark the area for future utility detection.

2.02 FABRICATION

A. Catch Basins:

1. Concrete shall be as specified in Section 033000, CAST-IN-PLACE CONCRETE.
2. Grates shall conform with RS Plan 311 incorporating any changes that may be shown on Drawings. Provide ADA compliant grates.
3. Grating Catch Basin-Alley shall conform with RS Plan 304.
4. Provide Catch Basin Inserts FloGard by Oldcastle Precast Inc. or approved equal.

2.03 MANHOLE COVERS

- A. Manhole covers shall conform with RS Plan 210 with "D" lettering.
- B. Clean out covers shall conform with RS Plan 204 with "D" lettering.

SECTION 334000 - STORM DRAIN SYSTEM

PART 3 - EXECUTION

3.01 GENERAL

- A. Install underground construction in accordance with the requirements of RS Subsection 306-1.
- B. Excavation and backfill for drainage structures shall be in accordance with the requirements of RS Subsection 300-3 except for Subsection 300-3.6 and unless otherwise specified in this Section.
- C. Examine prepared excavation and conditions for smoothness, compaction and level. Do not start installation until unsatisfactory conditions are corrected. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Engineer for resolution.

3.02 INSTALLATION

- A. Perform trench excavation to the depths shown on Drawings or as necessary for installation. Construct storm drainage without dewatering.
- B. Bedding Material and Drainage Structure Bases:
 - 1. Bedding shall conform to Reference Specification Subsection 306-1.2.1 and City of Long Beach Standard Plan 634.
 - 2. Compact bedding material to 95 percent relative density.
- C. Structures:
 - 1. Place and cure cast-in-place concrete structures in accordance with Section 033000, CAST-IN-PLACE CONCRETE.
- D. Metal Castings and Grates:
 - 1. Set frames and covers to the finish elevations shown on Drawings.
- E. Rock Reservoir:
 - 1. Preparation:
 - a. Place geogrid over prepared grade, with any joints overlapped by a minimum of 12 inches, extending over the entire excavation bottom.
 - b. Place the geotextile fabric on the geogrid, extending the excess portion of the rolls up the sides of the excavated area. Overlap the geotextile joints 12 inches or per manufacturer's recommendations.
 - c. It is helpful to identify the outline of the Rock Reservoir placement on the fabric, using spray paint or chalk line, to ensure adequate size.
 - d. The geotextile fabric will later be brought up and encompass all sides and the top of the Rock Reservoir.

SECTION 334000 - STORM DRAIN SYSTEM

2. Installation of Rainstore3 Cells:
 - a. Place Rock Reservoir material in prepared hole. Try to place without damaged to fabric and liner materials. Place metallic tape on top corners of installation to mark the area of future utility detection. Place a layer of geogrid directly over the top of the Rock fill to provide a secure walking surface. Place geotextile fabric layer over the top and sides to prevent soil entry into the rock fill. Take great care to avoid damage to fabric liner material during placement.
 - b. After placement of Rock fill, bring liner material up the sides and over the top of the rock, overlapping or sealing joints per manufacturer's recommendations. Fold excess fabric at corners to lay flat, securing folds and seams with staples or similar methods.
 - c. Identify locations of inlet, outlet, inspection manholes, and other penetrations of the liner, securing pipe into precut opening with stainless steel pipe clamps or ties. Support pipe in trenches and during backfill operations to prevent damage to liner or pipe.
 - d. Place backfill material over covered top surface and along the edge of the rock fill to provide vertical load support if necessary.
 - e. Use a powered mechanical compactor to conduct backfill operations on Rock Reservoir with care to avoid damage to liner while providing required compaction forces to the top level of the fill.
 - f. Place a geogrid layer over the top of the reservoir, extending beyond the outside edge of the excavation by at least 40 inches. Any joints must be overlapped by a minimum of 12 inches.
 - g. Place sufficient sandy gravel backfill material over geogrid to ensure support of design loads. Place cover backfill in 6-inch lifts and compact with vibrating plates or walk-behind rollers (do not use drivable rolling compactors) to a minimum of 95 percent with a minimum depth of 12 inches and a maximum depth of 36 inches. Take care to place backfill on top of the Rock Reservoir and avoid damage to structure or liner, using low pressure tire or track vehicles.
 - h. Ensure that all non-Reservoir construction traffic be kept away from the limits of excavation until the project is complete and final surface materials are in place.
 - i. Place surfacing materials, paving materials over the structure with care to avoid displacement of cover fill and damage to surrounding areas.
3. Cleaning:
 - a. Perform cleaning during the installation of work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

- F. Install detection tape as specified in Section 330527, DETECTION TAPE.

END OF SECTION

SECTION 335100
GAS DISTRIBUTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents:
 - 1. Related Documents: Drawings, Division H – General Requirements, Greenbook 2015 Edition, City Standard Plans – Technical Requirements: Off-Site Improvements and Division K – Technical Requirements: On-Site Improvements, apply to this Section.
- B. Section Includes:
 - 1. Gas Distribution System, consisting of furnishing transportation, labor, materials, and equipment to construct a gas distribution system.

1.02 RELATED SECTIONS

- A. Section 310000, EARTHWORK
- B. Section 312333, TRENCHING AND BACKFILLING
- C. Section 330527, DETECTION TAPE

1.03 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. ANSI B16.40, Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
 - 2. ANSI B31.8, Gas Transmission and Distribution Piping Systems
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D1248, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
 - 2. ASTM D2513, Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
 - 3. ASTM D2657, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
 - 4. ASTM D2774, Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
 - 5. ASTM D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

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6. ASTM D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- C. City of Long Beach Plumbing Code.
- D. Factory Mutual Laboratory (FM).
- E. International Association of Plumbing and Mechanical Officials (IAPMO):
 1. IS 12-90, Installation Standard for Polyethylene (PE) for Gas Yard Piping.
- F. Standard Specifications for Public Works Construction (RS):
 1. Subsection 306-1 - Open Trench Operations.
- G. Long Beach Energy Department requirements (LBED).
- H. Standard Plans, City of Long Beach Department of Public Works.
- I. Underwriters Laboratories (UL).

1.04 SUBMITTALS

- A. Materials descriptions and Drawings: Submit complete materials list, descriptions and drawings or catalog cuts for pipes, gas valves, valve boxes, fittings, anchor devices, pipe casings, and joints to the Engineer for review and approval.
- B. Testing Schedule and Methods: Submit to the Engineer for approval testing schedule, the methods of isolating the test from the system, the pressure monitoring techniques, and the equipment to be used for the test.
- C. Pressure Test Reports: Submit to the Engineer, in duplicate, test reports of pressure tests on piping and equipment.

1.05 PERMITS AND INSPECTION

- A. Permits: As required by Long Beach City Department of Building and Safety.
- B. Inspection: Inspection will be required for all installations prior to concealment and completion of the work by the Long Beach City Department of Building and Safety, Long Beach City Fire Department, the Engineer, and other authorities having jurisdiction. Final certificate of approval for the entire plumbing system shall be required. Any comments developed as a consequence of such inspection will be relayed to the Contractor by the Engineer.

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1.06 MATERIAL HANDLING AND STORAGE

- A. Store unprotected pipe in stockpiles built on a flat base.
- B. Do not store pipe in direct sunlight.
- C. Store valves and fittings on wooden platforms aboveground.

1.07 WORK BY LONG BEACH ENERGY RESOURCES DEPARTMENT

- A. The Long Beach Energy Resources Department will construct their gas line services after Contractor has completed grading and compacting of subgrade. Notify the Long Beach Energy Department when they can start construction of their gas lines.

PART 2 - PRODUCTS

2.01 PIPING

- A. Products shall be FM or UL listed and shall be labeled as such and shall bear the label of the agency, and comply with applicable standards.
- B. Yard Mains:
 - 1. Pipe shall be polyethylene (PE) per ASTM D2513.
 - a. 1/2-inch shall be SDR 9.
 - b. 3/4-inch and larger shall be SDR 11.
 - 2. Fittings:
 - a. Heat fusion fittings shall be PE 2306, PE 2406, PE 3408, PE 3046, or other listed materials. Mechanical connectors for PE pipe and for transition fittings shall be approved compression type couplings or other special listed joints.
 - 3. Markings:
 - a. Pipe shall be marked at intervals of not more than 2 feet with at least the following:
 - 1) Manufacturer's name or trademark.
 - 2) ASTM D2513.
 - 3) Pipe size.
 - 4) PE 3406, PE 2306, PE 2406 or PE 3408.
 - 5) SDA number.
 - 6) "Gas".
 - 7) Quality control markings.
 - 8) IAPMO certification to show compliance with this standard.
 - 9) "UL/FM".
 - b. Fittings: Fittings shall be marked with at least the following:
 - 1) Manufacturer's name or trademark.

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- 2) Size.
- 3) Material designation.
- 4) IAPMO certification to show compliance with this standard.
- c. Position of Markings: The identifying markings on pipe and fittings shall be visible for inspection without moving materials.
4. Joints:
 - a. Heat fused shall be made as recommended by the pipe manufacturer.
 - b. Mechanical shall be made in approved manner with tools recommended by the joint manufacturer. Mechanical joints shall be made with listed compression type couplings or other listed special fittings.
 - c. Joints to other materials: Listed plastic to steel transition fittings shall be installed on each end of the plastic piping system.

2.02 VALVES

- A. Product shall be FM or UL listed, bear the label of the agency, and comply with applicable standards.
- B. All plastic gas valves shall meet the requirements of ANSI B16.40.

2.03 BEDDING MATERIALS

- A. Pipe bedding shall be Case I bedding in conformance with the City of Long Beach Standard Plan 634 with a Class A (sand or gravel) bedding material unless shown otherwise on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Gas Distribution System: Install in accordance with ASTM D2774, Long Beach Plumbing Code, IAPMO IS 12-90 Standard and RS Subsection 306-1 except Subsection 306-1.6.
- B. Trench Excavation and Backfill: Trench excavation and backfilling shall be done in accordance with the Drawings, Section 312333, TRENCHING AND BACKFILLING, and applicable requirements of Section 310000, EARTHWORK. Trenches shall not be backfilled until approved by the Engineer. Jetting or flooding will not be permitted.

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- C. Piping:
 - 1. Install piping to dimensions, coordinates, and elevations established by the Drawings and standards.
 - 2. Prohibited joints:
 - a. PE shall not be threaded.
 - b. Joints made with adhesives or solvent cement.
 - 3. Plastic gas yard piping shall be permanently identified by a No. 18 copper tracer wire or other approved materials and shall be installed with and attached to underground non-metallic gas piping and shall terminate above grade at each end.
- D. Install valves per manufacturer's written recommendation.
- E. Depth of Cover:
 - 1. Where no profile information is shown on Drawings, the minimum cover on pipes shall be 3 feet. However, in the event of local interference or adjustments to meet existing pipe elevations, permission may be granted by the Engineer to rise above these elevations to avoid the obstruction.
 - 2. Realignment piping (to avoid localized interference and to meet grade of existing piping), where the resultant depth of cover in localized areas does not exceed 24 inches below the specified depth, shall be done at Contractor's expense.
 - 3. Measure depth of cover from top of pipe to finished grade.

3.02 CLEANING

- A. Prior to installation, clean piping to remove scale, sand, cutting chips, and the like. Remove loose material by compressed air.

3.03 TESTING OF YARD PIPING SYSTEM

- A. Gas yard piping system testing shall be done in accordance with Long Beach Plumbing Code.
- B. Locating leaks and repairing defects in gas piping or fittings shall be done in accordance with Long Beach Plumbing Code.
- C. Notify the Engineer and the Department of Building and Safety when the system is ready for testing. If the Engineer finds that the work will not satisfy Contract requirements, necessary corrections shall be made and the work shall be resubmitted for test and inspection.
- D. Pressure test shall be witnessed and approved by the Inspectors of Long Beach Building and Safety, Long Beach Fire Department, and the Engineer.

END OF SECTION